NOVEMBER, 1929

25 Cents, $1 a Year

Contractors and Engineers Monthly

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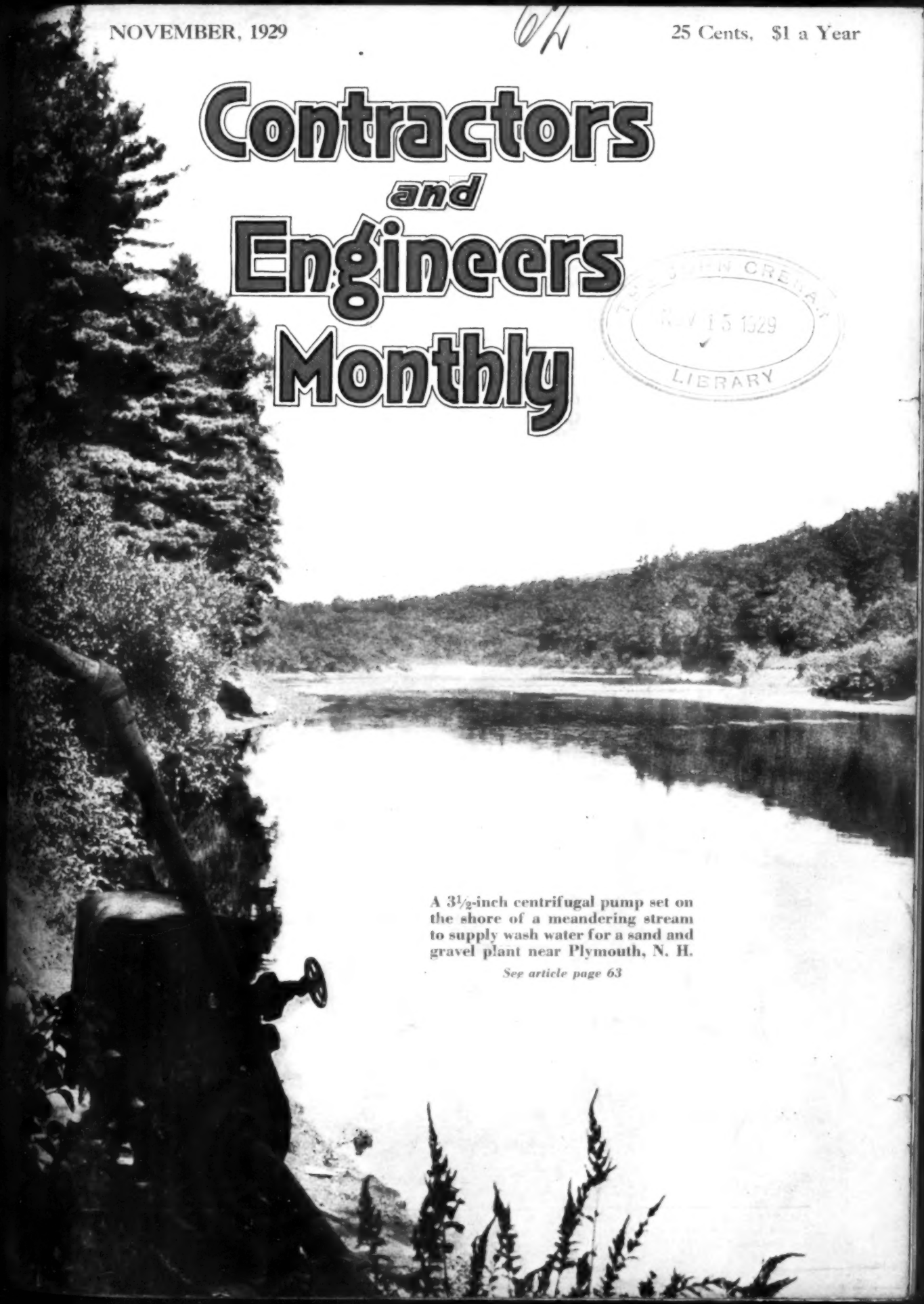


A 3½-inch centrifugal pump set on the shore of a meandering stream to supply wash water for a sand and gravel plant near Plymouth, N. H.

See article page 63

Announcing—

Mc KIERNAN-TERRY CORPORATION

A Consolidation of

McKiernan-Terry Drill Company
National Hoisting Engine Company
and Steele & Condict, Inc.

ON November First, the McKiernan-Terry Drill Company changed its corporate name to McKiernan-Terry Corporation and acquired ownership of and became the successor to The National Hoisting Engine Company of Harrison, N. J., and Steele & Condict, Inc., of Jersey City, N. J.

The consolidation of three firms with products going into the same fields has been effected to provide adequately for greater business expansion.

The National Hoisting Engine Company and Steele & Condict, Inc., will preserve their identity to the extent that they will operate and be known as Divisions of the McKiernan-Terry Corporation, but with executive activities transferred to the sales offices of the new corporation in New York.

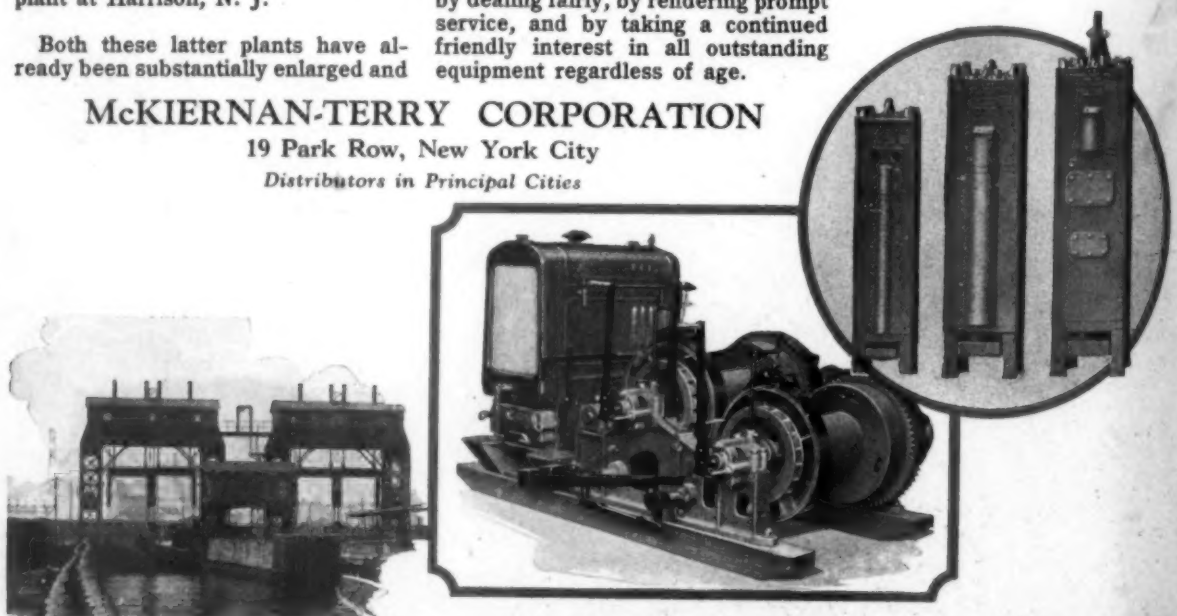
For economic reasons, work previously done at the plant of Steele & Condict, Inc., will be transferred to and divided between the McKiernan-Terry plant at Dover, N. J., and the National Hoisting Engine Company plant at Harrison, N. J.

Both these latter plants have already been substantially enlarged and further building expansion and increases of tool equipment are pending.

The prestige of the predecessor companies, dating back from one-quarter to two-thirds of a century, came from painstaking efforts to produce the best, to market at reasonable price, and to serve faithfully.

The McKiernan-Terry Corporation intends to uphold the same traditions and policies, and seeks to retain the good will of its customers which it has earned in years past by maintaining the excellence of its products, by dealing fairly, by rendering prompt service, and by taking a continued friendly interest in all outstanding equipment regardless of age.

McKIERNAN-TERRY CORPORATION
19 Park Row, New York City
Distributors in Principal Cities



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Where to Purchase

A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment.
The Index of Advertisers faces the inside back cover. When writing to advertisers please mention the CONTRACTORS & ENGINEERS MONTHLY. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

This index is published as an aid to the reader, but the publishers assume no responsibility for errors or omissions.

AIR COMPRESSORS

*Allis-Chalmers Mfg. Co., Milwaukee
*Buhl Company, Chicago
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Hove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Sullivan Machinery Co., Chicago
Acme Road Machy. Co., Frankfort, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Barnes Mfg. Co., Mansfield, O.
Cement-Gun Co., Allentown, Pa.
Chicago Pneumatic Tool Co., N. Y.
Cook Motor Co., Delaware, O.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
De Laval Steam Turbine Co., Trenton, N. J.
Fairbanks, Morse & Co., Chicago.
Gardner-Denver Co., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Independent Pn. Tool Co., Chicago, Ill.
Indiana Air Pump Co., Indianapolis, Ind.
Ingersoll-Rand Co., N. Y.
Nordberg Mfg. Co., Milwaukee, Wis.
Norwalk Iron Works Co., So. Norwalk, Conn.
Schramm, Inc., West Chester, Pa.
United Iron Works, Kansas City, Mo.
Westinghouse Traction Brake Co., Wilmerding, Pa.
Worthington Pump & Machinery Corp., N. Y.

AIR COMPRESSORS, PORTABLE

*Buhl Co., Chicago
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Sullivan Machinery Co., Chicago
Cement-Gun Co., Allentown, Pa.
Chain Belt Co., Milwaukee, Wis.
Chicago Pneumatic Tool Co., New York
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Independent Pn. Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York
Metalweld, Inc., Philadelphia, Pa.
National Brake & Electric Co., Milwaukee
Schramm, Inc., West Chester, Pa.
Simons Paint Spray Brush Co., Dayton, O.

ARTESIAN WELL DRILLS & PUMPS

American Well Works, Aurora, Ill.
Ingersoll-Rand Co., New York
Star Drilling Machine Co., Akron, O.

ASPHALT

*Barber Asphalt Co., Philadelphia
*Barrett Co., N. Y.
*Standard Oil Co. (Ind.), Chicago
*Standard Oil Co. (N. Y.), N. Y.
Atlantic Ref. & Asph. Corp., Philadelphia
Gulf Refining Co., Pittsburg
Ky. Rock Asph. Co., Louisville, Ky.
Natural Rk. Asph. Corp., Owensboro, Ky.
New Orleans Ref. Co., New Orleans
Pioneer Asph. Co., Lawrenceville, Ill.
Sinclair Ref. Co., Chicago
Standard Oil Co. of Cal., S. Francisco
Standard Oil Co. of La., N. Orleans
Standard Oil Co. of N. J., Newark
Texas Co., N. Y.
Utah Rock Asphalt Corp., Pueblo, Colo.
Warren Bros. Co., Boston

ASPHALT BLOCK

Hastings Pavement Co., N. Y.

ASPHALT BRICK

Asphalt Brick Co., St. Louis

ASPHALT CUTTERS

*Sullivan Machinery Co., Chicago
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, O.
Dayton Pneum. Tool Co., Dayton, O.
Gardner-Denver Co., Quincy, Ill.
Independent Pn. Tool Co., Chicago, Ill.
Ingersoll-Rand Co., N. Y.
Littleford Bros., Cincinnati.

ASPHALT KETTLES (See Kettles for Asphalt and Tar Heating)

ASPHALT PLANTS, TOOLS, ETC.

*American Fork & Hoe Co., Cleveland, O.
*Barber Asphalt Co., Philadelphia
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Company, Philadelphia
Aeroil Burner Co., West New York, N. J.
American Fin-Mix Co., Chicago.
Charleroi Iron Wks., Charleroi, Pa.
F. D. Cummer & Son Co., Cleveland, O.
J. D. Farasey Mfg. Co., Cleveland, O.
Hetherington & Berner, Indianapolis
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati
Merriman Asphalt Plant, Inc., Lima, O.
Warren Bros. Co., Boston

ASPHALT POURING POTS (See Pots, Asphalt Pouring)

ASPHALT ROLLERS (See Road Rollers)

ASPHALT SURFACE HEATERS

*Barber Asphalt Co., Philadelphia
*Chausse Oil Burner Co., Elkhart, Ind.
Aeroil Burner Co., West New York, N. J.
Equitable Asp. Maint. Co., Kan. City, Mo.
Hauck Mfg. Co., Brooklyn, N. Y.

BACKFILLERS

*Baker Mfg. Co., Springfield, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*General Wheelbarrow Co., Cleveland
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Ia.
Austin Mach. Corp., Muskegon, Mich.
Buckeye Trac. Ditcher Co., Findlay, O.
Byers Mach. Co., Ravenna, O.
Construction Machy. Co., Waterloo, Ia.
Ersted Mfg. Co., Portland, Ore.
General Excavator Co., Marion, O.
Harnischfeger Corp., Milwaukee, Wis.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Link-Belt Co., Chicago
Miami Trailer-Scraper Co., Troy, O.
Orton Crane & Shovel Co., Chicago
Star Drilling Mach. Co., Akron, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa
Waterman Corp., Detroit
Weller Mfg. Co., Chicago

BAGS

Bates Valve Bag Corp., Chicago

BAG TRUCKS

Bates Valve Bag Corp., Chicago
Case Crane & Engg. Co., Columbus, O.

BAR BENDERS AND CUTTERS

*Koehring Co., Milwaukee, Wis.
*Ransome Conc. Machy. Co., Dunellen, N. J.
Buffalo Forge Co., Buffalo, N. Y.
Concrete Steel Co., N. Y.
Electric Welding Co., Pittsburgh
D. A. Hinman & Co., Sandwich, Ill.
J. L. Gleason & Co., Boston, Mass.
Kardong Bros., Minneapolis
McKenna Co., Cleveland, O.

BARRICADE SUPPORTS

Cleveland Steel Spec. Corp., Cleveland, O.

BAR TIES

Bates Valve Bag Corp., Chicago
Symons Clamp & Mfg. Co., Chicago, Ill.

BATCH BOXES

*Blaw-Knox Co., Pittsburgh, Pa.
*Erie Steel Const. Co., Erie, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, O.
*Jos. Honhorst Co., Cincinnati
*Lakewood Eng. Co., Cleveland, O.
Butler Bin Co., Waukesha, Wis.
Easton Car & Const. Co., Easton, Pa.
Easton Car & Const. Co. of Mo., Kansas C., Mo.
Fairfield Engineering Co., Marion, Ohio
Koppel Ind. Car & Equip. Co., Koppel, Pa.
Littleford Bros., Cincinnati
Jas. B. Seaverns Co., Batavia, Ill.
Western Wheeled Scraper Co., Aurora, Ill.

BATCHERS (For Measuring Aggregates)

*Blaw-Knox Co., Pittsburgh, Pa.
*Erie Steel Construction Co., Erie, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, O.
Butler Bin Co., Waukesha, Wis.
Fairfield Engineering Co., Marion, Ohio
Superior Engineering Co., Warren, Ohio.

BEARINGS

Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bear. Co., Harrison, N. J.
New Departure Mfg. Co., Bristol, Conn.
S. K. F. Industries, New York
Timken Roller Bearing Co., Canton, O.

BINS, STORAGE

*Austin-Western Rd. Mach. Co., Chicago
*Beaumont Mfg. Co., Philadelphia
*Blaw-Knox Co., Pittsburgh, Pa.
*The Burch Corp., Crestline, Ohio
*Erie Steel Const. Co., Erie, Pa.
*Good Roads Mchy. Co., Kennett Sq., Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Industrial Brownhoist Corp., Cleveland, O.
*Ransome Conc. Machy. Co., Dunellen, N. J.
Austin Mfg. Co., Chicago
Birmingham Tank Co., Birmingham, Ala.
Butler Bin Co., Waukesha, Wis.
Canton Art Metal Co., Canton, Ohio
Easton Car & Const'n. Co., Easton, Pa.
Fairfield Engineering Co., Marion, Ohio
Galion Iron Works & Mfg. Co., Galion, Ohio
C. S. Johnson Co., Champaign, Ill.
Lancaster Iron Works, Inc., Lancaster, Pa.
Link-Belt Co., Chicago
Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa.
Jas. B. Seaverns Co., Batavia, Ill.
Superior Engineering Co., Warren, Ohio
Universal Rd. Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago.

BLADES FOR GRADERS & SNOW PLOWS

*Caterpillar Tractor Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
J. D. Adams & Co., Indianapolis
Galion Iron Works & Mfg. Co., Galion, Ohio
Shunk Mfg. Co., Bucyrus, Ohio

BLAST HOLE DRILLING MACHINES (See Well Drilling and Blast Hole Machines)

BLASTING POWDER (See Explosives)

BLOCKS AND TACKLE

*Boston & Lockport Blk. Co., Boston, Mass.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N.Y.
Western Block Co., Lockport, N. Y.

BLOW TORCHES

*Chausse Oil Burner Co., Elkhart, Ind.
*G. H. Williams Co., Erie, Pa.
Everhot Mfg. Co., Maywood, Ill.

BLUE PRINT MACHINES

Paragon Mach. Co., Rochester, N. Y.
C. F. Pease Co., Chicago
Wickes Bros., Saginaw, Mich.

BOILERS

*Johnston Bros., Inc., Ferrysburg, Mich.
Chandler & Taylor Co., Indianapolis
Chatta. Boiler & Tank Co., Chatta., Tenn.
R. D. Cole Mfg. Co., Newnan, Ga.
Combustian Eng. Corp., N. Y.
Erie City Iron Works, Erie, Pa.
Hartley Bir. Works, Montgomery, Ala.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heine Boiler Co., St. Louis, Mo.
E. Keeler Co., Williamsport, Pa.

For Directory of Local Distributors of Contractors' Equipment, See Pages 131 to 156

Where to Purchase

BOILERS, (Continued)
Ladd Water Tube Blr. Co., Pittsburgh, Pa.
V. Laffel & Co., Springfield, Ohio
Lord & Burnham Co., Irvington, N. Y.
Murray Iron Works Co., Burlington, Iowa
Nagle Eng. & Blr. Works, Erie, Pa.
New Bern Iron Works & Sup. Co., New Bern, N. C.
Petroleum Iron Works Co., Sharon, Pa.
J. S. Schofield's Sons Co., Macon, Ga.
Stanwood Corp., Cincinnati, Ohio
Superior Body Corp., Marion, Ind.
Vogt. Mchy. Co., Inc., Louisville, Ky.

BRACES, TRENCH
*Templeton, Kenly & Co., Chicago
Jas. H. Channon Mfg. Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Fisher & Hayes Rope & Steel Co., Chicago
Hawley Mfg. Co., Chicago
Kalamazoo Fdry. & Mach. Co., Kalamazoo, Mich.
Waldo Bros. & Bond Co., Boston

BRANDING TOOLS
Everhot Mfg. Co., Maywood, Ill.

BRASS GOODS
Glauber Brass Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Company, Decatur, Ill.
Union Water Meter Co., Worcester, Mass..
United-Obendorf Corp., Cleveland, Ohio

BREAKERS, CONCRETE
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, Ohio
Gardner-Denver Co., Quincy, Ill.
Hardscog Wonder Drill Co., Ottumwa, Iowa
Independent Pn. Tool Co., Chicago
Ingersoll-Rand Co., New York
Milwaukee Gas Tool Co., Milwaukee
Rapid Concrete Breaker Co., Los Angeles, Cal.

BRICK, PAVING (See Paving Brick)

BRIDGE FLOORS
*Armco Culvert Mfrs. Assn., Middletown, O.

BRIDGES AND BUILDINGS, STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
*Frederick Snare Corporation, N. Y.
American Bridge Co., N. Y.
Bellefontaine Br. & Stl. Co., Bellefontaine, O.
Belmont Iron Works, Philadelphia
Berlin Constr. Co., Berlin, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Boston Bridge Works, Boston
Butler Mfg. Co., Minneapolis, Minn.
Central States Br. Co., Indianapolis, Ind.
Champion Bridge Co., Wilmington, Ohio
Chesapeake Iron Works, Baltimore, Md.
Clinton Bridge Works, Clinton, Iowa
Eastern Bridge & Struc. Co., Worcester, Mass.
Fleur City Orn. Iron Co., Minneapolis
Fort Pitt Br. Works, Pittsburgh, Pa.
Hughes-Keenan Co., Mansfield, Ohio
Ingalls Iron Works Co., Birmingham, Ala.
Inter. Steel & Iron Co., Evansville, Ind.
Lakeside Br. & St. Co., No. Milwaukee.
Louisville Br. & Iron Co., Louisville, Ky.
McClintic Marshall Co., Pittsburgh, Pa.
Milwaukee Br. Co., Milwaukee, Wis.
Minn. Stl. & Mchy. Co., Minneapolis
Missouri Vy. Br. & Ir. Co., Leavenworth, Kan.
Mt. Vernon Br. Co., Mt. Vernon, Ohio
Penn Bridge Co., Beaver Falls, Pa.
Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa.
Richmond Struc. Stl. Co., Richmond, Va.
Riverside Br. Co., Martins Ferry, Ohio.
Virginia Br. & Ir. Co., Roanoke, Va.
Wisc. Br. & Ir. Co., No. Milwaukee, Wis.

BROOMS (See Street Sweeping Brooms)

BUCKETS, AUTOMATIC DUMPING
*Lakewood Eng. Co., Cleveland, O.
*Union Iron Wks., Inc., Hoboken, N. J.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, CLAM SHELL
*Blaw-Knox Co., Pittsburgh, Pa.
*Erie Steel Const. Co., Erie, Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Browning Crane Co., Cleveland, Ohio
Buffalo Hst. & Der. Co., Buffalo, N. Y.
F. A. Coleman Co., Cleveland, Ohio
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio
Page Eng. Co., Chicago

BUCKETS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
*Union Iron Works, Inc., Hoboken, N. J.
Morris K. Davis, San Francisco, Calif.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, DRAGLINE
*Beaumont Mfg. Co., Philadelphia
*Blaw-Knox Co., Pittsburgh, Pa.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Hayward Co., New York
*Sauerman Bros., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
*G. H. Williams Co., Erie, Pa.
Link-Belt Co., Chicago
Monighan Mach. Co., Chicago
Page Eng. Co., Chicago
Pioneer Bucket Co., Indianapolis, Ind.

BUCKETS, DREDGING AND EXCAVATING
*Blaw-Knox Co., Pittsburgh, Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Browning Crane Co., Cleveland
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio

BUCKETS, ORANGE PEEL
*Hayward Co., N. Y.
Industrial Works, Bay City, Mich.
J. F. Kiesler Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago

BUILDING FORMS (See Forms, Conc.)

BUILDINGS, STEEL (See Bridges)

BULLDOZERS
*Baker Mfg. Co., Springfield, Ill.
*Trackson Co., Milwaukee, Wis.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Miami Trailer-Scraper Co., Troy, Ohio

BUNKS AND COTS
Ft. Pitt Bedding Co., Pittsburgh, Pa.
Haggard & Marcusson Co., Chicago
Southern Rome Co., Baltimore, Md.

CABLES (See Wire and Cable)

CABLEWAYS, DRAGLINE
*Beaumont Mfg. Co., Philadelphia
*S. Flory Mfg. Co., Bangor, Pa.
*Sauerman Bros., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
L. P. Green, Chicago
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Street Bros. Mach. Works, Chattanooga

CARS FOR MOTOR TRUCKS
Highland Body Mfg. Co., Cincinnati, Ohio
Weatherproof Body Corp., Corunna, Mich.

CAISSONS
American Bridge Co., N. Y.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Foundation Co., N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
O'Rourke Eng. Constr. Co., N. Y.
Petroleum Ir. Wks. Co., Sharon, Pa

CALCIUM CHLORIDE FOR ROADS
*Dow Chemical Co., Midland, Mich.
*Pittsburgh Plate Glass Co., Barberton, O.
*Solvay Sales Corp., New York

CANS FOR GARBAGE AND REFUSE
American Can Co., N. Y.
Economy Baler Co., Ann Arbor, Mich.
Rochester Can Co., Rochester, N. Y.
Solar-Sturges Mfg. Co., Melrose Pk., Ill.
Witt Cornice Co., Cincinnati, Ohio

CAR UNLOADERS (See Loaders)

CARS, INDUSTRIAL V. DUMPING
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
Atlas Car & Mfg. Co., Cleveland, Ohio
Austin Mfg. Co., Chicago
Case Crane & Engg. Co., Columbus, O.
Chase Fdry. & Mfg. Co., Columbus, Ohio
Easton Car & Const. Co., Easton, Pa.
C. W. Hunt Co., W. New Brighton, N. Y.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.
United Ir. Wks., Inc., Kansas City, Mo.
Weller Mfg. Co., Chicago
Whiting Corp., Harvey, Ill.

CARTS, CONCRETE
*General Wheelbarrow Co., Cleveland, Ohio
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Case Crane & Engg. Co., Columbus, O.
Chattanooga Wheelbarrow Co., Chatta., Tenn.
Cleveland Wheelbarrow Co., Cleveland, Ohio
Easton Car & Const. Co., Easton, Pa.
E. D. Etnyre & Co., Oregon, Ill.
Gray Iron Fdry. Co., Reading, Pa.
Jackson Mfg. Co., Harrisburg, Pa.
Lee Trailer & Body Co., Plymouth, Ind.
Sterling Wheelbarrow Co., Milwaukee
Toledo Wheelbarrow Co., Toledo, Ohio

CAST IRON PIPE (See Pipe, Cast Iron)

CASTINGS, STEEL
*Brown Clutch Co., Sandusky, Ohio
*G. H. Williams Co., Erie, Pa.
Cleveland Steel Tool Co., Cleveland
Farrell-Cheek Steel Fdy. Co., Sandusky, Ohio
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

CASTINGS, STREET AND SEWER
*Armco Culvert Mfrs. Assn., Middletown, Ohio
*Central Fdry. Co., N. Y.
*U. S. Pipe & Fdry. Co., Burlington, N. J.
Canton Fdry. & Mach. Co., Canton, Ohio
H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
W. E. Dee Co., Chicago
Donley Bros. Co., Cleveland
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Galion Iron Works & Mfg. Co., Galion, O.
Gilbert Mfg. Co., Aberdeen, S. Dak.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Klauer Mfg. Co., Dubuque, Iowa
Madison Fdry. Co., Cleveland, Ohio
Pechstein Iron Works, Keokuk, Iowa
Sessions Foundry Co., Bristol, Conn.
South Bend Fdry. Co., So. Bend, Ind.

CATCH BASINS (See Castings, Street)

CATCH BASIN CLEANING OUTFITS
Atlas Sales Corp., New York
Elgin Sales Corp., N. Y.
Mack Trucks, Inc., N. Y.

CAULKING MACHINERY AND TOOLS
Cleveland Rock Drill Co., Cleveland, Ohio
Helwig Mfg. Co., St. Paul, Minn.
Independent Pn. Tool Co., Chicago
Ingersoll-Rand Co., New York
Mueller Company, Decatur, Ill.

CEMENT—(P. C. stands for Portland Cement)
Acme Cement Corp., Catskill, N. Y.
Ætna P. C. Co., Detroit, Mich.
Allentown P. C. Co., Catasauqua, Pa.
Alpha P. C. Co., Easton, Pa.
Ash Grove Lime & P. C. Co., Kansas City, Mo.
Atlas P. C. Co., N. Y.
Beaver P. C. Co., Portland, Ore.
Bessemer Limestone & C. Co., Youngstown, O.
British Col. Cement Co., Victoria, B. C.
Canada Cement Co., Ltd., Montreal, Canada
Colorado P. C. Co., Denver, Colo.
Columbia Products Co., Barberton, Ohio
Consolidated Cement Corp., Chicago
Cowell P. C. Co., Cowell, Cal.
Crescent P. C. Co., Wampum, Pa.
Dewey P. C. Co., Kansas City, Mo.
Diamond P. C. Co., Cleveland, Ohio
Edison P. C. Co., N. Y.
Georgia Cement & Stone Co., Birmingham, Ala.
Giant P. C. Co., Philadelphia, Pa.
Glens Falls P. C. Co., Glens Falls, N. Y.
Golden State P. C. Co., Los Angeles, Cal.
Great West'n P. C. Co., Kansas City, Mo.
Hawkeye P. C. Co., Des Moines, Iowa
Hercules Cement Corp., Philadelphia
Hermitage P. C. Co., Nashville, Tenn.
Huron P. C. Co., Detroit, Mich.
International Cement Corp., N. Y.
International P. C. Co., Ltd., Spokane, Wash.
Kosmos P. C. Co., Louisville, Ky.
La Toltoca Compania de Cemento Portland, Mexico City, Mex.
Lawrence Cement Co., New York
Lehigh P. C. Co., Allentown, Pa.
Louisville Cement Co., Louisville, Ky.
Manitowoc P. C. Co., Manitowoc, Wis.
Marlboro Cement Co., Edmonton, Can.
Marquette Cement Mfg. Co., Chicago
Missouri P. C. Co., St. Louis, Mo.

** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.**

This Test . . .

is winning many new users

. . . for GENERAL

ON every contracting job, speed is essential. If your wheelbarrow crews are to keep moving without interruption they must have reliable, well balanced, easy to handle barrows. Many times contractors to find quickly which barrows possess the essential . . . . Speed, have resorted to the test given below.

It is significant that time after time the barrow chosen, as a result of the test, is a General. This indicates a soundness in the engineering of the factors of strength, balance, rigidity and steadiness in General Barrows which gives them the essential . . . . Speed.

The test takes not more than five minutes. Try it. You'll be glad you took the time.

GENERAL WHEELBARROW CO.
Associated Companies: General Wheelbarrow Co., The Empire Plow Co.
3140 East 65th Street CLEVELAND, OHIO

Headquarters for Wheelbarrows, Concrete Carts, Steel Mortar Boxes, Salamanders, Coal Chutes, Agricultural Implements, Plow Shapes, Scrapers, Road Grader Blades.

General
General Wheelbarrow Co. Cleveland U.S.A.

Which barrow does the workman choose?

IN making a choice the workman doesn't reason out the factors of strength, rigidity, balance, speed, etc., and why they are or are not present in a barrow. He takes a short cut to his conclusion. He picks up one barrow—another—another; tests the weight of each on his hands and his shoulders; finds out in a jiffy which barrow wheels forward and backward easiest, which dumps forward and sideway most readily, and which tips least and is easiest to control. And then, "This one, he says." From all the barrows on the job the workman picks a General.

Where to Purchase

CEMENT (Continued)
Monarch Cement Co., Humboldt, Kans.
Monolith P. C. Co., Los Angeles, Cal.
National Cement Co., Birmingham, Ala.
Nazareth Cement Co., Nazareth, Pa.
Nebraska Cement Co., Denver, Colo.
Newago P. C. Cd., Newago, Mich.
New Egyptian P. C. Co., Detroit
North Amer. Cement Corp., Albany, N. Y.
Northwestern States P. C. Co., Mason City, Ia.
Oklahoma P. C. Co., Denver
Olympic P. C. Co., Ltd., Seattle
Oregon P. C. Co., Portland, Ore.
Pacific P. C. Co., San Francisco
Peerless P. C. Co., Detroit, Mich
Peninsular P. C. Co., Cement City, Mich.
Penn-Allen Cement Co., Nazareth, Pa.
Pennsylvania-Dixie Cement Corp., N. Y.
Petoskey P. C. Co., Petoskey, Mich.
Phoenix P. C. Co., Philadelphia
P. C. Co. of Utah, Salt Lake City
Pyramid P. C. Co., Des Moines
Riverside P. C. Co., Los Angeles
St. Marys Cement Co., Toronto, Can.
San Antonio P. C. Co., San Antonio
Sandusky Cement Co., Cleveland, Ohio
Santa Cruz P. C. Co., San Francisco
Signal Mountain P. C. Co., Chatta., Tenn.
Southern States P. C. Co., Rockport, Ga.
Southwest'n. P. C. Co., Los Angeles, Cal.
Standard P. C. Co., Cleveland
Standard P. C. Co., Cleveland
San P. C. Co., Portland, Ore.
Superior P. C. Co., Seattle, Wash.
Three Forks P. C. Co., Denver, Colo.
Tidewater P. C. Co., Baltimore, Md.
Trinity P. C. Co., Dallas, Tex.
Union P. C. Co., Denver, Colo.
U. S. P. C. Co., Denver, Colo.
Universal P. C. Co., Chicago
Utah Idaho Cement Co., Ogden, Utah
Vulcanite P. C. Co., Philadelphia
Wabash P. C. Co., Detroit
Warrior Cement Corp., Chatta., Tenn.
Wellston Iron Furnace Co., Jackson, Ohio
Wolverine P. C. Co., Coldwater, Mich.
Wyandotte P. C. Co., Detroit

CEMENT BLOCK MACHINES
Abrams Cement Tool Co., Detroit, Mich.
Cement Block Machy. Co., Newark, N. J.
Engelmeyer Cast Stone Block Machy Co., Bay City, Mich.

CEMENT GUNS
Cement-Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS
*American Fork & Hoe Co., Cleveland
Abrams Cement Tool Co., Detroit

CENTRIFUGAL PUMPS (See Pumps, Centrifugal)

CHAINS
Amer. Chain Co., Inc., Bridgeport, Conn.
Chain Belt Co., Milwaukee, Wis.
Columbus McKinnon Chain Co., Columbus, O.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
U. S. Chain & Forge Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CHIMNEYS, CONCRETE
Heine Chimney Co., Chicago
Rust Engineering Co., Pittsburgh, Pa.
Weber Chimney Co., Chicago

CHIMNEYS, RADIAL BRICK
Amer. Chimney Corp., N. Y.
Continental Chimney Co. of Chicago, Chicago
Alphons Custodis Chimney Const. Co., N. Y.
Heine Chimney Co., Chicago
H. R. Heinicke, Inc., Indianapolis, Ind.
M. W. Kellogg & Co., N. Y.
Rust Eng. Co., Pittsburgh, Pa.

CHIMNEYS, STEEL (See Stacks, Steel)

CHISELS, CHIPPING
Cleveland Steel Tool Co., Cleveland, Ohio

CHLORINATORS
*Wallace & Tiernan Co., Inc., Newark, N. J.
Norwood Engr. Co., Florence, Mass.
Paradon Mfg. Co., Arlington, N. J.

CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.

CLAMPS & TIES, FORM
*Insley Mfg. Co., Indianapolis
Batavia Clamp Co., Inc., Batavia, N. Y.
Concrete Form-Hold Co., Inc., Culver City, Cal.
Concrete Form Tie Corp., Pittsburgh, Pa.
Easy-Set Wall Tie Co., Dayton, O.
W. A. Kuhlman & Co., Toledo
M. & M. Wire Clamp Co., Minneapolis
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.
Wedgit Tie Co., Inc., New York

CLAMPS, COLUMN
*Ellis & Ford Mfg. Co., Detroit, Mich.
*Insley Mfg. Co., Indianapolis, Ind.
Black Bros. Co., Mendota, Ill.
Concrete Eng. Co., Omaha, Neb.
Handy Mfg. Co., Chicago
Kardong Bros., Inc., Minneapolis
W. A. Kuhlman & Co., Toledo, Ohio
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
J. E. Porter Corp., Ottawa, Ill.
H. W. Roos Co., Cincinnati
Steelform Contracting Co., San Francisco
Sterling Wheelbarrow Co., Milwaukee
Symons Clamp & Mfg. Co., Chicago
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.
Universal Form Clamp Co., Chicago
Wedgit Tie Co., Inc., New York

CLAY DIGGERS, PNEUMATIC
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Gardner-Denver Co., Quincy, Ill.
Independent Pn. Tool Co., Chicago
Ingersoll-Rand Co., New York

CLAY PIPE
(See Pipe, Vitrified Clay)

CLIPS, WIRE ROPE
*Amer. Steel & Wire Co., Chicago
Amer. Hoist & Derrick Co., St. Paul, Minn.
Fischer & Hayes Rope & Steel Co., Chicago
Hazard Wire Rope Co., Wilkesbarre, Pa.
Thos. Laughlin Co., Portland, Me.
Marion Malleable Iron Works, Marion, Ind.
C. M. Mockbee & Co., Cincinnati, Ohio
John A. Roebling Sons Co., Trenton, N. J.
Upson-Walton Co., Cleveland, Ohio

CLUTCHES
*Brown Clutch Co., Sandusky, Ohio
*Twin Disc Clutch Co., Racine, Wis.
*Waukesha Motor Co., Waukesha, Wis.
Brown-Lipe Gear Co., Syracuse, N. Y.
Link-Belt Co., Chicago

COCKS, CURB AND CORPORATION
Chapman Valve Mfg. Co., Indian Orch'd, Mass.
Glauber Brass Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
Union Wtr. Mtr. Co., Worcester, Mass.

COMPRESSORS, AIR (See Air Compressors)

CONCRETE BLOCK MACHINES (See Cement Block Machines)

CONCRETE CURING
*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Barberton, Ohio
*Solvay Sales Corp., New York

CONCRETE HEATERS
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Alex. Milburn Co., Baltimore, Md.
Aeroil Burner Co., West New York, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati

CONCRETE MIXERS
*Atlas Engineering Co., Clintonville, Wis.
*Jaeger Mach. Co., Columbus, Ohio
*Koehring Co., Milwaukee, Wis.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*John Lauson Mfg. Co., New Holstein, Wis.
*Ransome Con. Mchy. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Amer. Con. Mchy. Co., Inc., Keokuk, Iowa
Anchor Mfg. Co., Chicago
Archer Iron Works, Chicago
Badger Con. Mixer Co., Milwaukee
Chain Belt Co., Milwaukee, Wis.
Construction Mchy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
J. B. Foote Fdry. Co., Fredericktown, Ohio
Gray Iron Fdry. Co., Reading, Pa.
Judy Mfg. Co., Centerville, Iowa
Knickerbocker Co., Jackson, Mich.
Kwik-Mix Concrete Mixer Co., Port Washington, Wis.
Leach Co., Oshkosh, Wis.
Mixermobile Co., Milwaukee
Orr & Sembower, Reading, Pa.
Remmel Mfg. Co., Kewaskum, Wis.
Republic Iron Works, Tecumseh, Mich.
T. L. Smith Co., Milwaukee

CONCRETE PAVERS (See Pavers, Concrete)

CONCRETE PILING (See Piling)

CONCRETE PIPE (See Pipe, Concrete)

CONCRETE REINFORCEMENT
*American Steel & Wire Co., Chicago
*Truscon Steel Co., Youngstown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Wheeling, W. Va.
Electric Welding Co., Pittsburgh, Pa.
Ft. Pitt Bridge Works, Pittsburgh, Pa.
Genfire Steel Co., Youngstown, Ohio
Inland Steel Co., Chicago
Kalman Steel Co., Chicago
Laclede Steel Co., St. Louis, Mo.
National Steel Fabric Co., Pittsburgh
Republic Iron & Steel Co., Youngstown, Ohio
J. T. Ryerson & Son, Chicago
Wickwire-Spencer Steel Co., N. Y.
Youngstown Pressed Steel Co., Warren, Ohio

CONCRETE ROAD FINISHERS
*Blaw-Knox Co., Pittsburgh, Pa.
*A. W. French & Co., Chicago
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio

CONDENSERS
*Allis-Chalmers Mfg. Co., Milwaukee
Ingersoll-Rand Co., N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wheeler Cond. & Eng. Co., Carteret, N. J.
Worthington Pump & Machy. Corp., N. Y.

CONDUIT RODS
F. Bissell Co., Toledo, Ohio
Turbine Sewer Mch. Co., Milwaukee
Waldo Bros. & Bond Co., Boston

CONDUITS, UNDERGROUND
Amer. Vitr. Products Co., Akron, Ohio
Johns-Manville, Inc., N. Y.
National Fireproofing Co., N. Y.
Rie-wil Co., Cleveland

CONTRACTORS' EQUIPMENT DEALERS (See Pages 131 to 156

CONVEYORS, BELT
*Atlas Engineering Co., Clintonville, Wis.
*Austin-Western Rd. Mchy. Co., Chicago
*Barber-Greene Co., Aurora, Ill.
*The Burch Corp., Orestline, Ohio
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., New York
*Good Rds. Mchy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Jos. Honherst Co., Cincinnati
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Marion, Ohio
Galion Iron Works & Mfg. Co., Galion, Ohio
Gifford Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
New Holland Mch. Co., N. Holland, Pa.
Northern Conveyor Co., Janesville, Wis.
Samuel Olson & Co., Chicago
Portable Machinery Co., Clifton, N. J.
Robins Conv. Belt Co., N. Y.
Jas. B. Seaverns Co., Batavia, Ill.
Smith Eng. Wks., Milwaukee
Standard Conv. Co., No. St. Paul, Minn.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CONVEYORS, BUCKET
*Atlas Engineering Co., Clintonville, Wis.
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., N. Y.
*Good Roads Machy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Jos. Honherst Co., Cincinnati, Ohio
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, Ohio
H. W. Caldwell & Son, Chicago
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Marion, Ohio
Gifford Wood Co., Hudson, N. Y.
Godfrey Conv. Co., Elkhart, Ind.
Guarantee Constn. Co., N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
New Holland Mach. Co., N. Holland, Pa.
Samuel Olson & Co., Chicago
Republic Rubber Co., Youngstown, Ohio
Robins Conv. Belt Co., N. Y.
Jas. B. Seaverns Co., Batavia, Ill.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

WORLD LEADERS

IN THE SMALL SHOVEL FIELD

½ to 1¼ CU. YARDS

It is logical to expect that Bucyrus-Erie, world's largest exclusive manufacturers of excavating machinery, would have special facilities for the production of small equipment.

Separate factories, and a separate engineering organization of outstanding ability, are maintained for the sole manufacture of small excavating units — Gas, Diesel, Electric, Gas + Air and Diesel + Air. In addition, this small-unit division is privileged to draw on the sum-total experience of the Bucyrus-Erie organization.

Still more impressive is the fact that Bucyrus-Erie has more machines actually operating in the field than any other manufacturer of excavating machinery. Suitability for the job — and dependability in operation — are traditional features of Bucyrus-Erie shovels, large and small. And Bucyrus-Erie Service extends to every part of the civilized world!

Write for bulletin on the size of equipment you need.

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY

Plants: South Milwaukee, Wis., Erie, Pa., Evansville, Ind. General Offices: South Milwaukee, Wis.
Branch Offices: Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.
Representatives throughout the U. S. A. Offices and distributors in all principal countries.

OE-11-29-CEM

Where to Purchase

CONVEYORS, BUCKET (Continued)
Stephens Adamson Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CONVEYORS, GRAVITY
Lamson Co., Syracuse, N. Y.
Logan Co., Louisville, Ky.
Mathews Conveyor Co., Elwood City, Pa.
Standard Conv. Co., No. St. Paul, Minn.

COUPLINGS, HOSE, AIR AND WATER
*C. B. Hunt & Son, Salem, O.
*Independent Pneumatic Tool Co., Chicago
Cleveland Pneum. Tool Co., Cleveland, Ohio
Gilman Mfg. Co., East Boston, Mass.
Ingersoll-Rand Co., N. Y.
W. H. Keller, Inc., Grand Haven, Mich.
Mulconroy Co., Philadelphia

CRANES, CRAWLER
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
*Universal Crane Co., Lorain, Ohio
Austin Machy. Corp., Muskegon, Mich.
Byers Mach. Corp., Muskegon, Mich.
General Excavator Co., Marion, Ohio
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland
Mead-Morrison Mfg. Co., E. Boston
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Star Drilling Mach. Co., Akron, Ohio

CRANES, LOCOMOTIVE
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Iowa
*Thew Shovel Co., Lorain, Ohio
Amer. Hst. & Derrick Co., St. Paul, Minn.
Browning Crane Co., Cleveland, Ohio
Davenport Loc. Works, Davenport, Iowa
Link-Belt Co., Chicago
Loc. Crane Co. of Amer., Champaign, Ill.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Eng. Works, Chicago
Ohio Loc. Crane Co., Bucyrus, Ohio
Orton Crane & Shovel Co., Chicago
Jas. B. Seaverns Co., Batavia, Ill.
Speeder Mchy. Corp., Cedar Rapids, Iowa
U. S. Crane Co., Chicago

CRANES, ONE-TON
Hughes-Keenan Co., Mansfield, Ohio
Otis Eng. Co., New York
Sterling Tractor Equipment Co., New York
Whitehead & Kales Co., Detroit, Mich.

CRANES, OVERHEAD TRAVELING
*Erie Steel Const'n. Co., Erie, Pa.
Alliance Mach. Co., Alliance, O.
Chesapeake Iron Wks., Baltimore, Md.
Chisholm-Moore Mfg. Co., Cleveland
Curtis Pn. Mchy. Co., St. Louis
Harnischfeger Corp., Milwaukee, Wis.
Milwaukee Elec. Crane Co., Milwaukee
Morgan Eng. Co., Alliance, O.
Northern Eng. Wks., Detroit, Mich.
Shaw Crane Wks., Muskegon, Mich.
Shepard Elec. Cr. & Hst. Co., Montour Falls, N. Y.
Toledo Crane Co., Bucyrus, O.
Whiting Corp., Harvey, Ill.

CRANES, TRUCK
*Universal Crane Co., Lorain, Ohio
Atla Sales Corp., New York
Bay City Fdry. & Mach Co., Bay City, Mich.
Browning Crane Co., Cleveland
Byers Mach. Co., Ravenna, O.
Ersted Mfg. Co., Portland, Ore.
Harnischfeger Corp., Milwaukee, Wis.
Orton Crane & Shovel Co., Chicago

CRANES, WRECKING
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
Industrial Wks., Bay City, Mich.

CRAWLER ATTACHMENTS
*Geo. Haiss Mfg. Co., N. Y.
*Trackson Co., Milwaukee, Wis.
Belle City Mfg. Co., Racine, Wis.
Link-Belt Co., Chicago

CREEPER WHEELS
Creeper Wheel Co., Reading, Pa.

CREOSOTED BLOCKS, TIMBER, ETC.
Amer. Creos. Co., Inc., Louisville, Ky.
Amer. Creos. Wks., Inc., New Orleans, La.
Ayer & Lord Tie Co., Chicago
Carter Bloxonend Flooring Co., K. City, Mo.
Colonial Cre. Co., Inc., Louisville, Ky.
Compressed Wood Preserv. Co., Cincinnati, O.
Creos. Materials Co., New Orleans, La.
Georgia Creos. Co., Louisville, Ky.
Jennison-Wright Co., Toledo, O.
Long Bell Lumber Co., Kansas City, Mo.
Midland Creos. Co., Granite City, Ill.
Pensacola Creosoting Co., Pensacola, Fla.
Republic Creos. Co., Indianapolis, Ind.
Southern Wood Pres. Co., Atlanta, Ga.
Wyckoff Pipe & Creos. Co., N. Y.

CRUSHERS, ROCK
*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Machy. Co., Kennett Sq., Pa.
Acme Rd. Machy. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Gallion Ir. Wks. & Mfg. Co., Gallion, O.
New Eng. Road Machy. Co., So. Boston, Mass.
New Holland Mach. Co., New Holland, Pa.
Russell Grader Mfg. Co., Minneapolis
Smith Eng. Wks., Milwaukee
Sturtevant Mill Co., Boston
Universal Crusher Co., Cedar Rapids, Ia.
Universal Rd. Mchy. Co., Kingston, N. Y.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

CULVERTS, CAST IRON
*U. S. Pipe & Fdry. Co., Burlington, N. J.
American Casting Co., Birmingham, Ala.
Amer. C. I. Pipe Co., Birmingham, Ala.
Beach Mfg. Co., Charlotte, Mich.
Gallion Iron Wks. & Mfg. Co., Gallion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
R. D. Wood & Co., Philadelphia

CULVERTS, CORRUGATED METAL
*Armco Culvert Mfrs. Assn., Middletown, O.
*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Mach. Co., Kennett Sq., Pa.
American Casting Co., Birmingham, Ala.
Austin Mfg. Co., Chicago
Bark River Bridge & Culv. Co., Bark River, Mich.
Beach Mfg. Co., Charlotte, Mich.
Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
Berger Mfg. Co., Jacksonville, Fla.
Boardman Co., Okla. City, Okla.
Burnham Mfg. Co., Woods Cross, Utah
Calif. Corr. Culv. Co., W. Berkeley, Cal.
Canada Ingot Ir. Co., Ltd., Guelph, Ont.
Canton Culv & Silo Co., Canton, O.
Corr. Culv. Co., Moberly, Mo.
Decatur Cornice & Roofing Co., Albany, Ala.
Dixie Culv. & Metal Co., Atlanta, Ga.
Dixie Culv. Mfg. Co., Little Rock, Ark.
Edwards Mfg. Co., Cincinnati
Gallion Iron Wks. & Mfg. Co., Gallion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
R. Hardesty Mfg. Co., Denver, Colo.
Highway Prod. & Mfg. Co., Elmira, N. Y.
Iad. Corr. Culv. Co., Mason City, Ia.
Iowa Pure Ir. Co., Des Moines, Ia.
Kentucky Culvert Mfg. Co., Louisville, Ky.
Klauer Mfg. Co., Dubuque, Ia.
Lyle Culv. & Rd. Equip. Co., Minneapolis
Md. Culv. & Metal Co., Baltimore
Nebraska Culv. & Mfg. Co., Wahoo, Neb.
N. E. Metal Culv. Co., Palmer, Mass.
New England Metal Culvert Co., Nashua, N. H.
Newport Culvert Co., Newport, Ky.
Northfield Ir. Co., Northfield, Minn.
Northwest'n Sheet & Ir. Wks., Wahpeton, N.D.
Ohio Corr. Culv. Co., Middletown, O.
W. Q. O'Neall Co., Crawfordsville, Ind.
Pure Iron Culvert & Mfg. Co., Portland, Ore.
Road Supply & Metal Co., Topeka, Kan.
St. Paul Corr. Co., St. Paul, Minn.
Sioux Falls Metal Culv. Co., Sioux Falls, S. D.
So. Metal Culv. Co., Salisbury, N. C.
Spokane Culv. & Tank Co., Spokane, Wash.
Tenn. Metal Culv. Co., Nashville
U. S. Br. & Culv. Co., Bay City, Mich.
Virginia Culvert Corp., Roanoke, Va.
Western Metal Mfg. Co., Houston, Tex.
Wheeling Corr. Co., Wheeling, W. Va.
Wyatt Metal & Blr. Wks., Dallas, Tex.

CULVERT FORMS
*Blaw-Knox Company, Pittsburgh, Pa.
*Heltzel Steel Form & Iron Co., Warren, O.
Concrete Form Co., Inc., Syracuse, N. Y.
Northfield Iron Co., Northfield, Minn.

CURB BOXES
H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
Columbian Iron Wks., Chattanooga, Tenn.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Madison Fdry. Co., Cleveland, O.
Mueller Co., Decatur, Ill.
J. S. Schofield's Sons Co., Macon, Ga.
R. D. Wood & Co., Philadelphia, Pa.

CURB, GUTTER AND BASE FORMS (See Forms, Concrete)

CURB GUARDS, STEEL
W. S. Godwin Co., Baltimore

CURB, STEEL PROTECTED
*Truscon Steel Co., Youngstown, O.
Concrete Steel Co., N. Y.

CURING OF CONCRETE
*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Barberton, Ohio
*Solvay Sales Corp., N. Y.

CUTTERS, PIPE, HAND
*Ellis & Ford Mfg. Co., Detroit
Armstrong Mfg. Co., Bridgeport, Ct.
Barnes Tool Co., New Haven, Ct.
Erie Tool Works, Erie, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Oswego Tool Co., Oswego, N. Y.
Reed Mfg. Co., Erie, Pa.
Walworth Mfg. Co., Boston

CUTTERS, ROD AND WIRE
*Koehring Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carolus Mfg. Co., Sterling, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Helwig Mfg. Co., St. Paul, Minn.
M. & M. Wire Clamp Co., Minneapolis
Morse-Starrett Prod. Co., Oakland, Calif.
Worthington Pump & Mchy. Corp., N. Y.

CUTTING EDGES
*Caterpillar Tractor Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
J. D. Adams & Co., Indianapolis, Ind.
Shunk Mfg. Co., Bucyrus, O.

CUTTING AND WELDING APPARATUS (See Welding Apparatus)

CYLINDER HEADS, RICARDO
*Waukesha Motor Co., Waukesha, Wis.

DERRICKS, GUY AND STIFF-LEG
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N.Y.
*S. Flory Mfg. Co., Bangor, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Saugen Derrick Co., Chicago
Amer. Hst. & Derrick Co., St. Paul, Minn.
John T. Horton Co., N. Y.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
Lidgerwood Mfg. Co., Elizabeth, N. J.
National Hstg. Eng. Co., Harrison, N. J.
Street Bros. Mach. Wks., Chattanooga
Superior Iron Wks., Superior, Wis.
Universal Hstg. Machy. Corp., Buffalo

DERRICKS, PIPE LAYING
*Dobbie Fdry. & Mach. Co., Niagara Falls
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DERRICKS, REVOLVING
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
Street Bros. Mach. Wks., Chattanooga

DERRICKS, STEEL
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Hayward Co., N. Y.
*Insley Mfg. Co., Indianapolis, Ind.
Amer. Hst. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga
Taylor Port. St. Derrick Co., Chicago

DERRICKS, STEEL PORTABLE
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
Amer. Hst. & Derrick Co., St. Paul
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DERRICK FITTINGS
*S. Flory Mfg. Co., Bangor, Pa.
*Hayward Co., N. Y.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Amer. Hst. & Derrick Co., St. Paul
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DIAPHRAGM PUMPING OUTFITS
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*John Lauson Mfg. Co., New Holstein, Wis.

DIESEL ENGINES (See Engines, Oil)

DISTRIBUTORS, TAR AND ASPHALT
*Good Roads Machinery Co., Kennett Sq., Pa.
E. D. Etnyre & Co., Oregon, Ill.
Kinney Mfg. Co., Boston
Municipal Supply Co., So. Bend, Ind.

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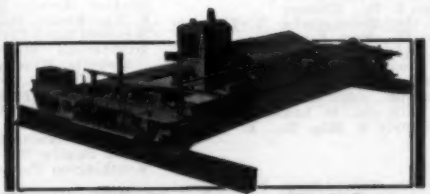

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Where to Purchase

DISTRIBUTING PLANTS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, O.
*Ransome Conc. Mchy. Co., Dunellen, N. J.

DITCHING MACHINES (See Excavators)

DOORS AND SHUTTERS, STEEL ROLLING
Cornell Iron Wks., L. I. City, N. Y.
Edwards Mfg. Co., Cincinnati, Ohio
Holzer Sheet Metal Works, New Orleans, La.
Kinnear Mfg. Co., Columbus, O.
James Peters & Son, Philadelphia
St. Paul Corrugating Co., St. Paul, Minn.
Variety Rolling Door Co., Westerville, O.
J. G. Wilson Corp., N. Y.

DRAGS, ROAD
*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*General Wheelbarrow Co., Cleveland
*Good Roads Machy. Co., Kennett Square, Pa.
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
C. D. Edwards Mfg. Co., Albert Lee, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
Miskin Scraper Wks., Ucon, Ia.
Slusser-McLean Scraper Co., Sidney, Ohio
Stockland Road Machinery Co., Minneapolis
Western Wheeled Scraper Co., Aurora, Ill.

DRAWING INKS
*Pelican Works, Gunther Wagner, New York
C. M. Higgins & Co., Brooklyn, N. Y.

DREDGES
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Hayward Co., N. Y.
*Osgood Company, Marion, Ohio
Amer. Steel Dredge Co., Ft. Wayne, Ind.
Ellicott Machy. Corp., Baltimore
Marion Steam Shovel Co., Marion, O.
Orton Crane & Shovel Co., Chicago
J. S. Schofield's Sons Co., Macon, Ga.
Stockton Iron Wks., Stockton, Cal.
Street Bros. Mach. Wks., Chattanooga
Superior Iron Wks., Superior, Wis.

DREDGES DIPPER
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Osgood Company, Marion, Ohio
Amer. Steel Dredge Co., Ft. Wayne, Ind.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.

DREDGES, HYDRAULIC
*Bucyrus-Erie Co., Erie, Pa.
Ellicott Mach. Corp., Baltimore
Marion Steam Shovel Co., Marion, O.
Morris Mach. Wks., Baldwinsville, N. Y.

DREDGING MACHINERY
*S. Flory Mfg. Co., Bangor, Pa.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DRILL STEEL SHARPENERS (See Sharpeners)

DRILLS, CORE
*Loomis Machine Co., Tiffin, Ohio
*McKiernan-Terry Corp., N. Y.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Sullivan Machy. Co., Chicago
Ingersoll-Rand Co., N. Y.

DRILLS, ROCK
*The Buhl Company, Chicago
*Loomis Machine Co., Tiffin, Ohio
*Sanderson-Cyclone Drill Co., Orrville, O.
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Cleveland Pneum. Tool Co., Cleveland, O.
Cleveland Rock Drill Co., Cleveland, O.
Dallett Co., Philadelphia
Gardner-Denver Co., Quincy, Ill.
Gilman Mfg. Co., E. Boston
Hardsocg Wonder Drill Co., Ottumwa, Ia.
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York
W. H. Keller, Inc., Grand Haven, Mich.
Wood Drill Wks., Paterson, N. J.

DRILLS FOR WELLS AND BLAST HOLES (See Well Drilling Machy.)

DRUMS, HOLDING
*Blaw-Knox Co., Pittsburgh, Pa.
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Hayward Co., New York
*Heltzel Steel Form & Ir. Co., Warren, O.
Street Bros. Mach. Wks., Chattanooga

DRYERS, ASPHALT AND CEMENT
*Allis-Chalmers Mfg. Co., Milwaukee
Amer. Blower Co., Detroit, Mich.
Atlas Dryer Co., Cleveland, O.
C. O. Bartlett & Snow Co., Cleveland, O.
F. D. Cummer & Son Co., Cleveland, O.
Lancaster Iron Works, Inc., Lancaster, Pa.
Ruggles-Coles Engineering Co., New York.

DRYERS, SAND AND GRAVEL
*Chausse Oil Burner Co., Elkhart, Ind.
*Jos. Honhorst Co., Cincinnati, O.
Aeroil Burner Co., West New York, N. J.
American Process Co., New York
C. O. Bartlett & Snow Co., Cleveland, O.
Chase & Lyman, Boston
Littleford Bros., Cincinnati, O.
Alex. Milburn Co., Baltimore, Md.

DUMP BODIES FOR CONCRETE
Easton Car & Const. Co., Easton, Pa.
Lee Trailer & Body Co., Plymouth, Ind.

DUMP BODIES FOR MOTOR TRUCKS
*Columbian St. Tank Co., Kansas City, Mo.
*Highway Trailer Co., Edgerton, Wis.
*Wood Hydr. Hoist & Body Co., Detroit
Amer. Prod. & Trad. Co., Chicago
Am. Truck & Body Co., Martinsville, Va.
Anthony Co., Streator, Ill.
Atlas Sales Corp., New York
Columbia Body Corp., Columbia, Pa.
Detroit Trailer & Mach. Co., Detroit
Detwiler Mfg. Co., Galion, O.
Eagle Wagon Wks., Auburn, N. Y.
Easton Car & Const. Co., Easton, Pa.
Galion All Steel Body Co., Galion, O.
Griscom-Russell Co., N. Y.
Heil Co., Milwaukee
Herr Dump Car Mfg. Co., Coatesville, Pa.
Hughes-Keenan Co., Mansfield, O.
The Hug Co., Highland, Ill.
Jennings Aut. Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Plymouth, Ind.
Mack Trucks, Inc., N. Y.
Mandt Body Co., Keokuk, Ia.
Marion Steel Body Co., Marion, O.
Martin-Parry Corp., York, Pa.
N. Y. Central Ir. Wks., Hagerstown, Md.
Pechstein Iron Wks., Keokuk, Ia.
Stewart Iron Wks. Co., Cincinnati
Van Dorn Iron Wks. Co., Cleveland, O.

DUMP CARTS AND WAGONS, HORSE
*Austin-Western Road Machy. Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
Acme Road Machy Co., Frankfort, N. Y.
Acme Wagon Co., Emigsville, Pa.
J. D. Adams & Co., Indianapolis
Austin Mfg. Co., Chicago
Bain Wagon Co., Kenosha, Wis.
Columbia Body Corp., Columbia, Pa.
Eagle Wagon Wks., Auburn, N. Y.
Gilbert Mfg. Co., Aberdeen, S. D.
G. H. Holsbog & Bro., Jeffersonville, Ind.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Little Red Wagon Co., Omaha, Neb.
Luedinghaus-Espenchied Wagon Co., St. Louis
Smith Trailer Co., Syracuse, N. Y.
Stockland Road Machinery Co., Minneapolis
Streich Bros., Oshkosh, Wis.
Western Wheeled Scraper Co., Aurora, Ill.

DUMP WAGONS (ALL STEEL), TRACTOR DRAWN
*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
*Euclid Crane & Hoist Co., Euclid, O.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Smith Trailer Co., Syracuse, N. Y.
Trail-IT Co., St. Paul, Minn.

DYNAMITE (See Explosives)

EARTH BORING EQUIPMENT
*Highway Trailer Co., Edgerton, Wis.

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS
*Allis-Chalmers Mfg. Co., Milwaukee
American Motors Co., Cedarburg, Wis.
The Louis Allis Co., Milwaukee
Crocker-Wheeler Co., Ampere, N. J.
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York
Ideal Electric & Mfg. Co., Mansfield, O.
Lincoln Electric Co., Cleveland, O.
Northwestern Mfg. Co., Milwaukee, Wis.
Robbins & Myers Co., Springfield, O.
Wagner Electric Mfg. Co., St. Louis
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS
General Electric Co., Schenectady, N. Y.
Westinghouse Lamp Co., N. Y.

ELECTRIC LIGHTING PLANTS
*Allis-Chalmers Mfg. Co., Milwaukee
Climax Eng. Co., Clinton, Ia.
Cook Motor Co., Delaware, O.
Cushman Motor Works, Lincoln, Neb.
Fairbanks, Morse & Co., Chicago
Fuller & Johnson Mfg. Co., Madison, Wis.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York
Klauer Mfg. Co., Dubuque, Iowa
Kohler Co., Kohler, Wis.
Sunbeam Electric Mfg. Co., Evansville, Ind.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC TRANSFORMERS
*Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Kuhlman Electric Co., Bay City, Mich.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC WIRES (See Wire)

ELEVATORS, BUCKET
*Atlas Engineering Co., Clintonville, Wis.
*Austin-Western Rd. Machy. Co., Chicago
*Conveying Weigher Co., N. Y.
*Good Rds. Machy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
Abrams Cement Tool Co., Detroit
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, O.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Marion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Littleford Bros., Cincinnati
New Holland Mch. Co., N. Holland, Pa.
Robins Convertible Belting Co., N. Y.
Spears-Wells Machy Co., Oakland, Cal.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Univ. Rd. Machy. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
Worthington Pump & Mchy. Corp., N. Y.

ELEVATORS, PASSENGER, FREIGHT, ETC.
Am. Elev. & Mach. Co., Louisville, Ky.
Atlantic Elev. Co., Inc., Philadelphia
Bay State Elev. Co., Springfield, Mass.
Haughton Elev. & Mach. Co., Toledo, O.
Llewellyn Ir. Wks., Los Angeles, Cal.
Montgomery Elevator Co., Moline, Ill.
Otis Elevator Co., N. Y.
C. Ridgway & Son Co., Coatesville, Pa.
A. B. See Electric Elevator Co., N. Y.
Speidel Elevator Corp., Reading, Pa.
Warner Elevator Mfg. Co., Cincinnati
Warsaw Elevator Co., Warsaw, N. Y.
Westinghouse Elec. Elevator Co., E. Pittsburgh, Pa.

ENGINES, DREDGING
Murray Iron Works Co., Burlington, Ia.

ENGINES, GAS AND GASOLINE
*Allis-Chalmers Mfg. Co., Milwaukee
*Caterpillar Tractor Co., San Leandro, Cal.
*Continental Motors Corp., Muskegon, Mich.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Electric Wheel Co., Quincy, Ill.
*Evinrude Motor Division, Milwaukee
*Hercules Motors Corp., Canton, O.
*John Lauson Mfg. Co., New Holstein, Wis.
*Le Roi Co., Milwaukee
*Novo Engine Co., Lansing, Mich.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Beaver Mfg. Co., Milwaukee, Wis.
Buda Co., Harvey, Ill.
Charter Gas Engine Co., Sterling, Ill.
Chicago Pneumatic Tool Co., N. Y.
Climax Engineering Co., Clinton, Ia.
Cook Motor Co., Delaware, O.
Cushman Motor Works, Lincoln, Neb.
Ersted Mfg. Co., Portland, Ore.
Fairbanks Morse & Co., Chicago
Foos Gas Engine Co., Springfield, O.
Fuller & Johnson Mfg. Co., Madison, Wis.
Hinkley Motors, Inc., Detroit
F. Van Rossen Hoogendyk, New York
Ingersoll-Rand Co., New York
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Servel Mfg. Co., Evansville, Ind.
Sterling Engine Co., Buffalo, N. Y.
Universal Motor Co., Oshkosh, Wis.
Weber Engine Co., Kansas City, Mo.
Wisconsin Motor Mfg. Co., Milwaukee
Witte Engine Works, Kansas City, Mo.
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, HOISTING (See Hoists)

ENGINES, INDUSTRIAL (See Power Plants, Industrial)

ENGINES, KEROSENE
*Electric Wheel Co., Quincy, Ill.
*Hercules Motors Corp., Canton, O.
*John Lauson Mfg. Co., New Holstein, Wis.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Climax Engineering Co., Clinton, Ia.
Fuller & Johnson Mfg. Co., Madison, Wis.
Witte Engine Works, Kansas City, Mo.

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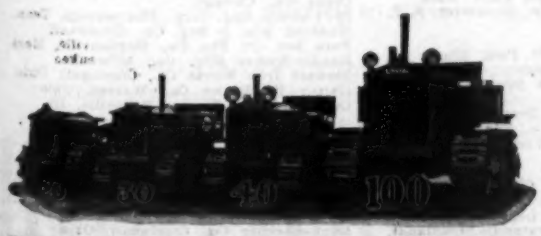

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ENGINES, OIL, DIESEL
*Allis-Chalmers Mfg. Co., Milwaukee
*Hoover Mfg. & Eng. Co., Freeport, Ill.
Anderson Engine & Fdry. Co., Anderson, Ind.
Bessemer Gas Eng. Co., Grove City, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buckeye Machinery Co., Lima, O.
Busch Sulzer Bros.-Diesel Eng. Co., St. Louis
Charter Gas Engineering Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York
De La Vergne Machinery Co., New York
Fairbanks, Morse & Co., Chicago
Fulton Iron Works Co., St. Louis
F. Van Rossem Hoogendyk, New York
Ingersoll-Rand Co., New York
Lombard Governor Co., Ashland, Mass.
McIntosh & Seymour Corp., Auburn, N. Y.
Muncie Oil Engine Co., Muncie, Ind.
New London Ship & Eng. Co., Groton, Ct.
Nordberg Mfg. Co., Milwaukee, Wis.
St. Mary's Oil Eng. Co., St. Charles, Mo.
Taylor Machinery Co., Cleveland, O.
Weber Engineering Co., Kansas City, Mo.
Western Machy. Co., Los Angeles, Cal.
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, PUMPING
*Allis-Chalmers Mfg. Co., Milwaukee
*Hercules Motors Corp., Canton, O.
*Hoover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Climax Engineering Co., Clinton, Ia.
Hooven, Owens, Rentschler Co., Hamilton, O.
Murray Iron Works, Burlington, Ia.
Nordberg Mfg. Co., Milwaukee
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, SWINGING
*I. S. Mundy Eng. Engine Co., Newark, N. J.
Dake Engine Co., Grand Haven, Mich.
Lidgerwood Mfg. Co., Elizabeth, N. J.

EXCAVATING MACHINERY (See Names Under Excavators, also Steam Shovels)

EXCAVATORS, CABLEWAY
*Beaumont Mfg. Co., Philadelphia
*Sauerman Bros., Inc., Chicago
*Scheidel-Burkett Constr. Co., Macon, Ga.
Erstad Mfg. Co., Portland, Ore.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Link-Belt Co., Chicago
Street Bros. Machine Works, Chattanooga

EXCAVATORS, CRAWLING TRACTOR
*Bucyrus-Erie Co., Erie, Pa.
*Geo. Haiss Mfg. Co., New York
*Tracksen Co., Milwaukee, Wis.
*Industrial Brownhoist Corp., Cleveland
*Osgood Company, Marion, Ohio
W. M. Blair Mfg. Co., Chicago, Ill.
Byers Machine Co., Ravenna, O.
General Excavator Co., Marion, Ohio

EXCAVATORS, DITCH AND TRENCH
*Barber-Greene Co., Aurora, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Geo. Haiss Mfg. Co., New York
*Hayward Co., New York
*Industrial Brownhoist Corp., Cleveland
*Insley Mfg. Co., Indianapolis, Ind.
*Manitowoc Engr. Wks., Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Ia.
*Thew Shovel Co., Lorain, O.
Austin Mach. Corpn., Muskegon, Mich.
Buckeye Traction Ditcher Co., Findlay, O.
Byers Machine Co., Ravenna, O.
Cleveland Trencher Co., Euclid, O.
Economy Exc. Co., Iowa Falls, Ia.
Erstad Mfg. Co., Portland, Ore.
General Excavator Co., Marion, Ohio
Keystone Driller Co., Beaver Falls, Pa.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.
Monighan Machinery Co., Chicago
Ohio Power Shovel Co., Lima, Ohio
Orton Crane & Shovel Co., Chicago
Owensboro Ditcher & Grader Co., Owensboro, Ky.
Speeder Mchy. Corp., Cedar Rapids, Ia.
Star Drilling Machinery Co., Akron, O.
Street Bros. Machine Works, Chattanooga
C. T. Topping Machinery Co., Dayton, O.

EXCAVATORS, DRAG-LINE
*Bay City Shovels, Inc., Bay City, Mich.
*Beaumont Mfg. Co., Philadelphia
*Bucyrus-Erie Co., Erie, Pa.
*Hayward Co., New York
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee
*Manitowoc Engr. Wks., Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Sauerman Bros., Chicago
*Scheidel-Burkett Constr. Co., Macon, Ga.
*Thew Shovel Co., Lorain, O.
Amer. Hoisting & Derrick Co., St. Paul
Austin Machy. Corp., Muskegon, Mich.
Byers Machine Co., Ravenna, O.
Economy Exc. Co., Iowa Falls, Ia.
Erstad Mfg. Co., Portland, Ore.
C. L. Gade, Iowa Falls, Ia.
General Excavator Co., Marion, Ohio
L. P. Green, Chicago
Galion Iron Wks. & Mfg. Co., Galion, O.
Harnischfeger Corp., Milwaukee, Wis.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Page Engineering Co., Chicago
Speeder Mchy. Corp., Cedar Rapids, Ia.
Star Drilling Machine Co., Akron, O.
Street Bros. Machine Works, Chattanooga

EXPANDED METAL
*Truscon Steel Co., Youngstown, O.
Berger Mfg. Co., Canton, Ohio
Consolidated Exp. Metal Co., Wheeling, W. Va.
Decatur Cornice & Roofing Co., Albany, Ala.
Northwestern Exp. Metal Co., Chicago
Wheeling Corrugating Co., Wheeling, W. Va.
Youngstown Pressed Steel Co., Warren, O.

EXPANSION JOINT MATERIAL
*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
*Philip Carey Co., Cincinnati, O.
*W. E. Meadows, Inc., Elgin, Ill.
*Truscon Steel Co., Youngstown, O.
Hoosier Asphalt Co., Alexandria, Ind.
Pioneer Asphalt Co., Lawrenceville, Ill.
Servicised Products Corp., Chicago
Texas Co., New York
Waring-Underwood Co., Philadelphia

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Austin Powder Co., Cleveland, O.
Egyptian Powder Co., East Alton, Ill.
E. I. Du Pont De Nemours & Co., Wilmington, Del.
Equitable Powder Mfg. Co., E. Alton, Ill.
Giant Powder Co., San Francisco, Cal.
Grasselli Powder Co., Cleveland, O.
Hercules Powder Co., Wilmington, Del.
Ill. Powder Mfg. Co., St. Louis, Mo.
King Powder Co., Cincinnati, O.
Union Explosives Co., Clarksburg, W. Va.
U. S. Powder Co., Terre Haute, Ind.

FENCING
*American Steel & Wire Co., Chicago
Adrian Wire Fence Co., Adrian, Mich.
Amer. Fence Const. Co., New York
Anchor Post Fence Co., New York
Cyclone Fence Co., Waukegan, Ill.
Dwiggins Wire Fence Co., Anderson, Ind.
Edwards Mfg. Co., Cincinnati
Ill. Wire & Mfg. Co., Joliet, Ill.
Ind. Steel & Wire Co., Muncie, Ind.
Interlocking Fence Co., Morton, Ill.
Keystone Steel & Wire Co., Peoria, Ill.
Kokomo Steel & Wire Co., Kokomo, Ind.
Mich. Wire Fence Co., Adrian, Mich.
Nitselman Bros., Muncie, Ind.
Page Stl. & Wire Prod. Corp., Bridgeport, Ct.
Pittsburgh Steel Co., Pittsburgh, Pa.
Stewart Ir. Wks. Co., Cincinnati, O.
Tex. Cyclone Fence Co., Ft. Worth, Tex.
Van Dorn Iron Works Co., Cleveland, O.
Wayne Iron Works, Wayne, Pa.
Wickwire-Spencer Steel Co., New York

FILING EQUIPMENT, STEEL
Art Metal Constr. Co., Jamestown, N. Y.
Berger Mfg. Co., Canton, O.
Canton Art Metal Co., Canton
Gen. Fireproofing Co., Youngstown, O.
Van Dorn Iron Works Co., Cleveland, O.

FILTERS, OIL
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.

FILTERS, WATER
Amer. Water Softener Co., Philadelphia, Pa.
Cochran Corp., Philadelphia, Pa.
Graver Corporation, E. Chicago, Ind.
International Filter Co., Chicago
Norwood Engineering Co., Florence, Mass.
Roberts Filter Co., Darby, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

FINISHING MACHINES, CONCRETE ROAD (See Concrete Road Finishers)

FIRE & POLICE ALARM SYSTEMS
Eagle Signal Sales Corp., Moline, Ill.
Gamewell Co., Newton Upper Falls, Mass.
Sterling Siren Fire Alarm Co., Rochester, N. Y.

FIRE ALARM SIRENS
Erick Electric Siren Co., St. Paul, Minn.
Federal Sign System, Chicago
Hendrie & Bolthoff Mfg. & Sup Co., Denver, Colo.
Holtzer-Cabot Electric Co., Boston
Sterling Siren Fire Alarm Co., Rochester, N. Y.
Union Water Meter Co., Worcester, Mass.

FIRE APPARATUS, MOTOR
Ahrens-Fox Fire Eng. Co., Cincinnati, Ohio
Amer-La France & Foamite Corp., New York
Boyer Fire Apparatus Co., Logansport, Ind.
Brockway Motor Fire Apparatus Co., Cortlandt, N. Y.
Buffalo Fire Appl. Corp., Buffalo, N. Y.
Hale Fire Pump Co., Conshohocken, Pa.
Mack Trucks, Inc., New York
Northern Fire Apparatus Co., Minneapolis, Minn.
Peter Pirsch & Sons Co., Kenosha, Wis.
Prospect Fire Engine Co., Prospect, Ohio
Seagrave Co., Columbus, Ohio
Waterous Fire Eng. Works, St. Paul, Minn.
White Co., Cleveland

FIRE HOSE (See Hose, Fire)

FLEXIBLE JOINTS
*Central Foundry Co., New York
*U. S. Pipe & Fdry. Co., Burlington, N. J.
Coldwell-Wilcox Co., Newburgh, N. Y.
Crane Co., Chicago
United Lead Company, New York

FLOOD LIGHTING PROJECTORS
B. B. T. Corp., Philadelphia, Pa.
Crouse-Hinds Co., Syracuse, N. Y.
General Electric Co., Schenectady
Sperry Gyroscope Co., Brooklyn, N. Y.

FLOOD LIGHTS, PORTABLE
*Alexander Milburn Co., Baltimore
*National Carbide Sales Corp., New York
*Oxweld Acetylene Co., New York
General Electric Co., Schenectady, N. Y.
Kohler Co., Kohler, Wis.
Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

FLOORING, COMPOSITION
*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
Am. Mason Safety Tr. Co., Lowell, Mass.
Johns-Manville, Inc., New York
Marine Decking & Sup. Co., Philadelphia, Pa.
Franklyn R. Muller & Co., Waukegan, Ill.

FLOORS, WOOD BLOCK
*Barrett Co., New York
Carter Blaxenend Flooring Co., Kansas City, Mo.
Jennison-Wright Co., Toledo, Ohio
Midland Creos. Co., Toledo, Ohio
Republic Creos. Co., Indianapolis, Ind.
Sou. Wood Preserving Co., Atlanta, Ga.
Wyckoff Pipe & Creos. Co., New York

FLUSH TANKS
Pacific Flush Tank Co., Chicago and N. Y.

FLUSHERS, STREET (See Street Flushers and Sprinklers)

FORGES, OIL (Rivet Heating)
Hauck Mfg. Co., Brooklyn, N. Y.
Mead-Morrison Mfg. Co., E. Boston

FORMS, CONCRETE ROAD
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Truscon Steel Co., Youngstown, Ohio
Hotchkiss Stl. Products Co., Binghamton, N. Y.
Metal Forms Corp., Milwaukee

FORMS, CONCRETE PIPE
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Steel Form & Iron Co., Warren, O.
Concrete Form Co., Syracuse, N. Y.
Eclipse Mach. Co., Kendallville, Ind.
Martin Iron Works, Los Angeles, Cal.
Quinn Wire & Iron Works, Boone, Iowa

FORMS, MANHOLE, PIPE, SEWER, ETC.
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio

FORMGRADERS
Ted Carr & Co., Chicago

FOUNTAINS, DRINKING
Jas. B. Clow & Sons, Chicago
Crane Co., Chicago
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Murdock Mfg. & Sup. Co., Cincinnati
Puro San. Dr. Ftn. Co., Haydenville, Mass.
Rundle-Spence Mfg. Co., Milwaukee
Stewart Iron Works Co., Cincinnati, Ohio
Halsey W. Taylor Co., Warren, Ohio
Century Brass Works, Belleville, Ill.

FRESNOES (See Scrapers, Rotary)

GAGES, WATER LEVEL
Bristol Co., Waterbury, Conn.
Builders Iron Foundry, Providence, R. I.
W. & L. E. Gurley, Troy, N. Y.
Lunkenheimer Co., Cincinnati, Ohio
Simplex Valve & Meter Co., Phila.
Walworth Mfg. Co., Boston

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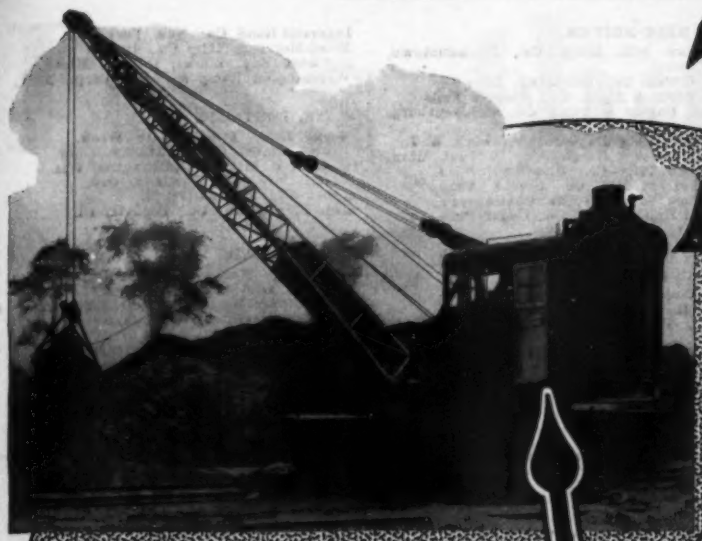

TIME.

Tells The Truth About Cranes

YOU wouldn't buy a suit of clothes that did not fit and which would look shoddy after you had worn it a few times. Neither should you buy a crane that isn't suited to your work and which will need extensive repairs after two or three years of service.

When you buy an Industrial Brownhoist crane, you can be sure of getting just the right size and type for your work. Building only quality equipment, and with the most complete line of cranes ever developed, Industrial Brownhoist maintains a large engineering department whose job it is to meet the needs of each individual crane owner.

Time tells the truth about crane maintenance and depreciation costs. That is why Industrial Brownhoist has built far more machines than any other maker and why many of them, though twenty to thirty years old, are still at work.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.
Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST

Where to Purchase

GARBAGE CANS (See Cans)

GARBAGE COLLECTION EQUIPMENT
*Highway Trailer Co., Edgerton, Wis.
Atlas Sales Corp., New York City
Detroit Trailer & Mach. Co., Detroit
Freuhauf Trailer Co., Detroit, Mich.
Heil Co., Milwaukee
Geo. H. Holzbog & Bros., Jeffersonville, Ind.
Lee Trailer & Body Co., Plymouth, Ind.
Littleford Bros., Cincinnati
E. Nicoll & Co., New York
Smith Trailer Co., Syracuse, N. Y.
Troy Trailer & Wagon Co., Troy, Ohio

GARBAGE DISPOSAL SYSTEMS
American Beccari Corp., New York
C. O. Bartlett & Snow Co., Cleveland
Decarie Incinerator Co., L. I. City, N. Y.
Goder Incinerator Corp., Chicago
Hiler Eng. & Const. Co., Brooklyn, N. Y.
Morse-Boulger Destructor Co., New York
Nye Odorless Incinerator Corp., Albany, Ga.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Superior Incinerator Co. of Dallas, Dallas, Tex.

GASOLINE STORAGE TANKS
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Chicago Bridge & Iron Works, Chicago
Graver Corp., East Chicago, Ind.
Heil Co., Milwaukee, Wis.
Lancaster Iron Works, Inc., Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Wm. B. Scaife & Sons, Pittsburgh, Pa.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
United Iron Works, Inc., Kansas City, Mo.
Wayne Co., Fort Wayne, Ind.

GATES, SLUICE
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston, Mass.
Coldwell-Wilcox Co., Newburgh, N. Y.
R. Hardesty Mfg. Co., Denver
Rodney Hunt Machine Co., Orange, Mass.
Ludlow Valve Mfg. Co., Troy, N. Y.

GATES FOR PARKS AND CEMETERIES
Stewart Iron Works Co., Cincinnati, Ohio
Wayne Iron Works, Wayne, Pa.

GLASS, FIREPROOF (See Wire Glass)

GRADERS, ROAD (See Road Graders)

GRADER BLADES
*General Wheelbarrow Co., Cleveland, O.
J. D. Adams & Co., Indianapolis, Ind.
Galion Ir. Works & Mfg. Co., Galion, Ohio
Shunk Mfg. Co., Bucyrus, Ohio

GRAND STANDS, PORTABLE
Circle-A. Prod. Corp., Newcastle, Ind.
Leavitt Mfg. Co., Urbana, Ill.
Wayne Iron Works, Wayne, Pa.

GRATING, STEEL
*Blaw-Knox Co., Pittsburgh
Hendrick Mfg. Co., Carbondale, Pa.

GREASE
*D-A Lubricant Co., Inc., Indianapolis
*Jos. Dixon Crucible Co., Jersey City, N. J.

GRIZZLIES
*Allis-Chalmers Mfg. Co., Milwaukee
Austin Mfg. Co., Chicago
Robins Conv. Belt Co., New York
Smith Engineering Works, Milwaukee
Stephens-Adamson Mfg. Co., Aurora, Ill.

GUARD RAIL, HIGHWAY
*Am. Steel & Wire Co., Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
Cyclone Fence Co., Waukegan, Ill.
W. S. Godwin Co., Baltimore, Md.
Hazard Wire Rope Co., Wilkesberre, Pa.
J. H. Ramsey, Albany, N. Y.
W. F. Robertson Stl. & Iron Co., Cincinnati
Stewart Iron Works Co., Cincinnati
Wickwire-Spencer Steel Co., New York

HAMMERS, STEAM, PILE (See Pile Hammers, Steam)

HEATING KETTLES (See Kettles)

HITCHES
*Gustav Schaefer Co., Cleveland, Ohio
Detroit Trailer & Machine Co., Detroit
Trail-IT Co., St. Paul, Minn.
Whitehead & Kales Co., Detroit

HOISTS, BELT-DRIVEN
*Amer. Saw Mill Mchy. Co., Hackettstown, N. J.
*Brown Clutch Co., Sandusky, Ohio
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Domestic Engine & Pump Co., Shippensburg, Pa.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
American Hoist & Derrick Co., St. Paul, Minn.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston, Mass.
Street Bros. Mach. Works, Chattanooga
Universal Hoist & Mfg. Co., Cedar Falls, Ia.
Weller Mfg. Co., Chicago
William Hoist Co., Los Angeles, Calif.

HOISTS, CONCRETE, TOWER
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Nove Engine Co., Lansing, Mich.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
English Bros. Machy Co., Kansas City
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co. ,Boston
Street Bros. Mach. Works, Chattanooga

HOISTS, ELECTRIC
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*S. Flory Mfg. Co., Bangor, Pa.
*Industrial Brownhoist Corp., Cleveland
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Nove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Sullivan Machy. Co., Chicago
Am. Hoist & Derrick Co., St. Paul, Minn.
Chisholm-Moore Co., Cleveland, Ohio
Construction Machy. Co., Waterloo, Ia.
Dake Eng. Co., Grand Haven, Mich.
Norris K. Davis San Francisco, Calif.
English Bros. Machy. Co., Kansas City, Mo.
Erstad Mfg. Co., Portland, Ore.
Harnischfeger Corp., Milwaukee
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Northern Engineering Works, Detroit
Sterling Machinery Corp., Kansas City, Mo.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Treadwell Engineering Co., Easton, Pa.
Universal Hoist & Mfg. Co., Cedar Falls, Iowa
Vulcan Iron Works, Wilkes-Barre, Pa.
Williams Hoist Co., Los Angeles, Calif.

HOISTS, GASOLINE
*Amer. Cement Mach. Co., Inc., Keokuk, Iowa
*Amer. Saw Mill Mchy Co., Hackettstown, N. J.
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee
*Clyde Iron Works Sales Co., Duluth, Minn.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*S. Flory Mfg. Co., Bangor, Pa.
*Lansing Co., Lansing, Mich.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Nove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
Am. Hoist & Derrick Co., St. Paul, Minn.
Amer. Mfg. & Eng. Co., Kalamazoo, Mich.
Austin Mfg. Co., Chicago
Beach Mfg. Co., Charlotte, Mich.
Buffalo Hoist & Derrick Co., Buffalo, N. Y.
Construction Machy. Co., Waterloo, Ia.
Dake Eng. Co., Grand Haven, Mich.
Norris K. Davis San Francisco, Calif.
Dyrr Mfg. Co., Huntington Park, Calif.
English Bros. Machy. Co., Kansas City, Mo.
Erstad Mfg. Co., Portland, Ore.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Sterling Machinery Corp., Kansas City, Mo.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Universal Hoist & Mfg. Co., Cedar Falls, Iowa
Williams Hoist Co., Los Angeles, Calif.

HOISTS, HAND
*Beebe Bros., Inc., Seattle, Wash.
*Dobbie Fdy. & Machine Co., Buffalo, N. Y.

HOISTS, PNEUMATIC
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Curtis Pneumatic Mchy. Co., St. Louis
Dake Eng. Co., Grand Haven, Mich.
Detroit Hoist & Mach. Co., Detroit
Gardner-Denver Co., Quincy, Ill.
Gilman Mfg. Co., E. Boston, Mass.
Hanna Engineering Works, Chicago
Independent Pneu. Tool Co., Chicago
Ingersoll-Rand Co., New York
Mead-Morrison Mfg. Co., Boston
Northern Eng. Works, Detroit, Mich.
Worthington Pump & Mchy. Corp., N. Y.

HOISTS, PORTABLE
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
Erstad Mfg. Co., Portland, Ore.
Joliet Mfg. Co., Joliet, Ill.
Jas. B. Seaverns Co., Batavia, Ill.

HOISTS, STEAM
*Clyde Iron Works Sales Co., Duluth, Minn.
*S. Flory Mfg. Co., Bangor, Pa.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Sullivan Machinery Co., Chicago
Am. Hoist & Derrick Co., St. Paul, Minn.
Dake Eng. Co., Grand Haven, Mich.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Ingersoll-Rand Co., New York
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Treadwell Engineering Co., Easton, Pa.

HOISTS FOR MOTOR TRUCKS
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, Ohio
*Wood Hydr. Hoist & Body Co., Detroit
Atlas Sales Corp., New York
Erstad Mfg. Co., Portland, Ore.
Heil Co., Milwaukee
Hydr. Hoist Mfg. Co., St. Paul, Minn.
Joliet Mfg. Co., Joliet, Ill.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Van Dorn Iron Works Co., Cleveland, Ohio

HOPPERS, CONCRETE (Aggregate Measuring)
*Blaw-Knox Company, Pittsburgh, Pa.
*Erie Steel Const'n Co., Erie, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Butler Bin Co., Waukesha, Wis.
C. S. Johnson Co., Champaign, Ill.
Jas. B. Seaverns Co., Batavia, Ill.
Superior Engineering Co., Warren, Ohio

HOSE, AIR
*The Buhl Company, Chicago
Chicago Pneumatic Tool Co., New York
Cincinnati Rubber Mfg. Co., Cincinnati
Cleveland Rock Drill Co., Cleveland, Ohio
The Dallett Co., Philadelphia, Pa.
Gilman Mfg. Co., East Boston, Mass.
Goodyear Tire & Rubber Co., Akron, Ohio
Independent Pneu. Tool Co., Chicago
Ingersoll-Rand Co., New York
Mulconroy Co., Inc., Philadelphia, Pa.
Penna. Flexible Metallic Tubing Co., Phila., Pa.
Republic Rubber Co., Youngstown, Ohio
United States Rubber Co., New York

HOSE COUPLINGS (See Couplings, Hose)

HOSE, FIRE
Bi-Lateral Fire Hose Co., Chicago
Eureka Fire Hose Mfg. Co., New York
Fabric Fire Hose Co., New York
B. F. Goodrich Rubber Co., Akron, Ohio
Goodyear Tire & Rubber Co., Akron, Ohio

HOUSE NUMBERS
Hamilton Metal Prod. Co., Hamilton, Ohio
C. H. Hanson Co., Chicago
Niagara Metal Stamping Corp., Niagara Falls, N. Y.

HOUSES, PORTABLE (See Portable Buildings)

HYDRANTS, FIRE
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Columbian Ir. Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Iowa
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Michigan Valve & Fdry. Co., Detroit
Norwood Eng. Co., Florence, Mass.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Vogt Bros Mfg. Co., Louisville, Ky.
Waterous Co., St. Paul
R. D. Wood & Co., Philadelphia, Pa.

HYDRAULIC RAMS
Deming Co., Salem, Ohio

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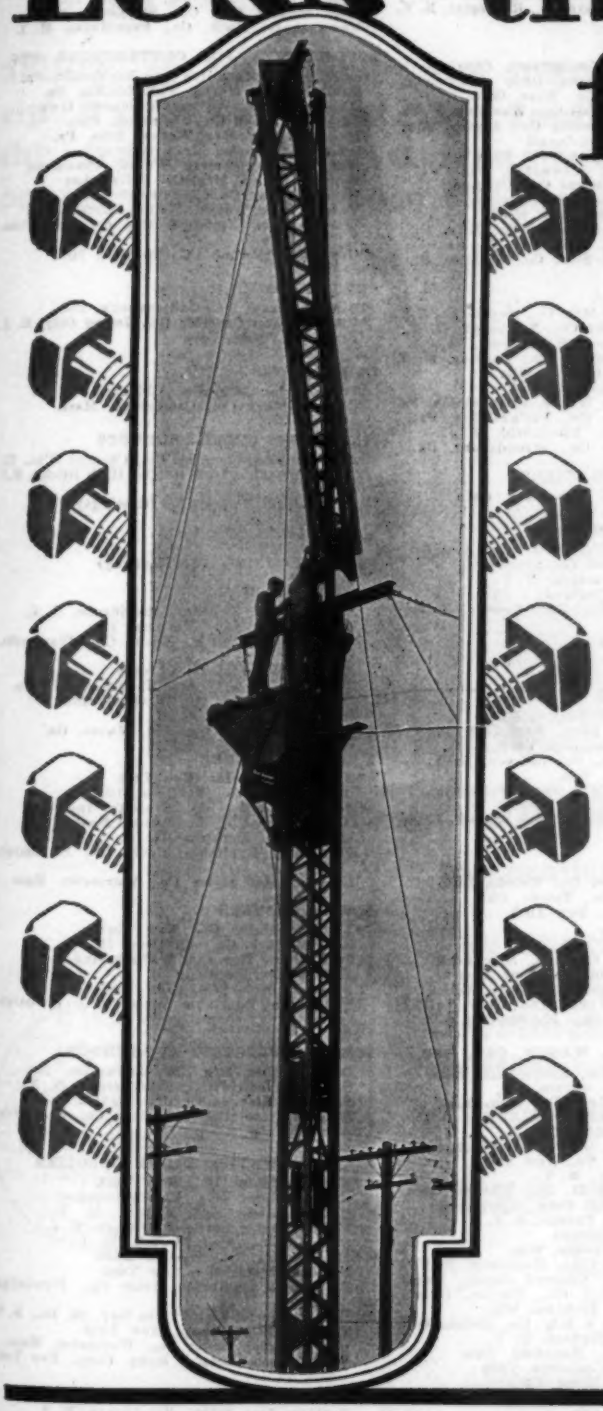
Less than one field bolt per foot



THE steel mast of an Insley Mast Hoist requires less than one field bolt per running foot of mast.

Do you know of any other bolted tower—either steel or wood—for hoisting concrete that can be set up with less than a single bolt per lineal foot?

No, you do not—because there is no other.

There are 20 bolts to every splice between two sections of Insley Mast—each section is 20 feet long—the top mast section requires no field bolts—therefore there are required 20 field bolts less than the number of lineal feet of steel mast—less than one bolt per foot.

This is only one of many features of the Insley Mast Hoist that keep the cost of erection down to the point where it is almost negligible.

The Insley Mast Hoist is all round equipment useful alike on any kind of job—either with or without chutes—and is permanent steel equipment which can be set up on job after job without depreciation.

INSLEY MANUFACTURING CO.
Engineers and Manufacturers
INDIANAPOLIS, INDIANA
Division of National Equipment Corporation

INSLEY

INSLEY NEC

736

Where to Purchase

Johnson Mfg. Co., Seattle, Wash.
Rife Hydraulic Engine Co., New York
Ramsey Pump Co., Seneca Falls, N. Y.

IGNITION SYSTEMS
*Bosch Magneto Corp., New York
American Bosch Magneto Corp., Springfield, Mass.
Dayton Eng. Lab. Co., Dayton, Ohio
Splitdorf Electric Co., Newark, N. J.

INCINERATORS, GARBAGE (See Garbage Disposal)

INDICATOR POSTS (See Valves)

INSPECTING LABORATORIES
*Conard & Busby, Burlington, N. J.
*Patnig Testing Laboratories, Des Moines, Ia.
Allentown Testing Laboratory, Allentown, Pa.
E. L. Conwell & Co., Philadelphia, Pa.
Gulick-Henderson Co., New York
Robert W. Hunt Co., Chicago, Ill.
New York Testing Lab., New York
Pittsburgh Testing Lab., Pittsburgh

INSTRUMENTS AND SUPPLIES (Surveyors' and Engineers')
Wm. Ainsworth & Sons, Denver, Col.
L. Beckman Co., Toledo, Ohio
C. L. Berger & Sons, Boston
Brandis & Sons Mfg. Co., Brooklyn, N. Y.
Buff & Buff Mfg. Co., Boston
Eugene Dietzgen Co., Chicago
W. & L. E. Gurley, Troy, N. Y.
Keuffel & Esser Co., Hoboken, N. J.
Kolesch & Co., New York
A. Lietz Co., San Francisco
Loepold-Voipel & Co., Portland, Ore.
Lufkin Rule Co., Saginaw, Mich.
Warren-Knight Co., Philadelphia, Pa.
F. Weber & Co., Philadelphia, Pa.
David White Co., Milwaukee, Wis.

INTEGRAL CURB AND BASE FORMS (See Forms, Concrete)

IRON WORK, STRUCTURAL AND ORNAMENTAL, (See Bridges and Buildings)

JACKS, LIFTING
*McKiernan-Terry Corp., New York
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Joyce-Cridland Co., Dayton, Ohio
A. O. Norton, Inc., Moline, Ill.
Oil Jack Co., New York
Ross Mfg. Co., Pittsburgh, Pa.
Watson-Stillman Company, New York

JACKS, PIPE FORCING
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Easy Mfg. Co., Lincoln, Neb.

JAIL AND PRISON WORK
Price & Son Steel Const. & Eng. Co., Covington, Ky.
Manly Jail Works, Dalton, Ga.
Pauly Jail Building Co., St. Louis, Mo.
Southern Prison Co., San Antonio, Tex.
Stewart Iron Works Co., Cincinnati, Ohio
Van Dorn Iron Works Co., Cleveland

JOINTS, EXPANSION PAVING (See Expansion Joint Material)

JOINTS, FLEXIBLE PIPE (See Flexible Joints)

JOISTS, STEEL
*Truscon Steel Co., Youngstown, Ohio
Berger Mfg. Co., Canton, Ohio
Genfre Steel Co., Youngstown, Ohio
Ingalls Steel Prod. Co., Birmingham, Ala.

KETTLES, FOR ASPHALT AND TAR
*Barber Asphalt Co., Philadelphia, Pa.
*Chicago Oil Burner Co., Elkhart, Ind.
*Connery & Co., Inc., Philadelphia, Pa.
*Good Roads Mchy. Co., Kennett Square, Pa.
*Jos. Heuberst Co., Cincinnati, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Acme Rd. Mach. Co., Frankfort, N. Y.
Aeroll Burner Co., West New York, N. J.
Beach Mfg. Co., Charlotte, Mich.
Charleroi Iron Wks., Charleroi, Pa.
Chace & Lyman, Boston, Mass.
Hauck Mfg. Co., Brooklyn, N. Y.
Kinney Mfg. Co., Boston, Mass.
Lancaster Iron Works, Inc., Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Macleod Co., Cincinnati, Ohio
Spears-Wells Mchy. Co., Oakland, Cal.
G. L. Stuebner Ir. Wks., Inc., Long Island City, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.
Universal Rd. Mach. Co., Kingston, N. Y.

LANTERNS, CONTRACTORS'
*E. E. Dietz Co., New York
*Alex. Milburn Co., Baltimore, Md.
*National Carbide Sales Corp., New York
Defiance Lantern & Stamping Co., Rochester, N. Y.
Economy Electric Lantern Co., Chicago
Handlan, Buck Mfg. Co., St. Louis
National Carbon Co., Inc., New York City
Star Headlight & Lantern Co., Rochester, N. Y.

LATH, METAL
*Truscon Steel Co., Youngstown, Ohio
Berger Mfg. Co., Canton, Ohio
Bostwick Steel Lath Co., Niles, Ohio
Consolidated Exp. Metals Co., Wheeling, W.Va.
Decatur Cornice & Roofing Co., Albany, Ala.
Edwards Mfg. Co., Cincinnati
Genfre Steel Co., Youngstown, Ohio
Milwaukee Corr. Co., Milwaukee, Wis.
Northwestern Exp. Metal Co., Chicago
Penn. Metal Co., Boston, Mass.
St. Paul Corr. Co., St. Paul, Minn.
Sykes Metal Lath and Roofing Co., Niles, O.
Wheeling Corr. Co., Wheeling, W. Va.
Youngstown Pressed Steel Co., Warren, O.

LAWN MOWERS
Chadborn & Coldwell Mfg. Co., Newburgh, N.Y.
Coldwell Lawn Mower Co., Newburgh, N. Y.
Gilson Mfg. Co., Port Washington, Wis.
Ideal Power Lawn Mower Co., Lansing, Mich.
Jacobson Mfg. Co., Racine, Wis.
Modern Mach. Works, Milwaukee
Penna. Lawn Mower Works, Philadelphia, Pa.
Phila. Lawn Mower Co., Philadelphia, Pa.
S. P. Townsend Co., Bloomfield, N. J.
Worthington Mower Co., Stroudsburg, Pa.

LAWN MOWER SHARPENERS
Fate-Root-Heath Co., Plymouth, Ohio

LEAD-MELTING FURNACES
Aeroll Burner Co., West New York, N. J.
Chicago Flexible Shaft Co., Chicago
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati, Ohio
A. P. Smith Mfg. Co., East Orange, N. J.

LETTERING GUIDES
Wood-Regan Inst. Co., So. Orange, N. J.

LIGHTS, ACETYLENE
*Alex Milburn Co., Baltimore, Md.
*Natl. Carbide Sales Corp., New York
*Oxweld Acetylene Co., New York
General Electric Co., Schenectady, N. Y.
Kohler Co., Kohler, Wis.
Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

LIGHTING STANDARDS (See Street Lamp Posts)

LIGHTS, WARNING
*Toledo Pressed Steel Co., Toledo, Ohio
McCloskey Torch Co., Toledo, Ohio
National Carbon Co., New York

LIQUID CHLORINE
Arnold, Hoffman & Co., Inc., New York
Electro Bleaching Gas Co., New York
Hooker Electrochemical Co., New York
Mathieson Alkali Works, Inc., New York
Penna. Salt Mfg. Co., Philadelphia, Pa.

LOADERS, GRAVEL, WAGON, CAR, ETC.
*Atlas Engineering Co., Clintonville, Wis.
*Barber-Greene Co., Aurora, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Burch Corp., Crestline, Ohio
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., New York
*Geo. Haiss Mfg. Co., N. Y.
*Holtzel St. Form & Ir. Co., Warren, Ohio
*Industrial Brownhoist Corp., Cleveland
*Nelson Iron Works, Passaic, N. J.
*Sauerman Bros., Chicago
*Trackson Co., Milwaukee, Wis.
Bonney Supply Co., Inc., Rochester, N. Y.
Conant Mach. Co., Concord Junct., Mass.
Fairfield Engineering Co., Marion, Ohio
F-S Mfg. Co., New Holstein, Wis.
Galion Iron Works & Mfg. Co., Galion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Hughes-Keenan Co., Mansfield, Ohio
Jeffrey Mfg. Co., Columbus, Ohio
Kent Machine Co., Kent, Ohio
Lee Trailer & Body Co., Plymouth, Ind.
Link-Belt Co., Chicago
Logan Co., Louisville, Ky.
New Holland Mch. Co., N. Holland, Pa.
Northern Conveyor Co., Janesville, Wis.
Portable Machinery Co., Clifton, N. J.
H. B. Sackett Screen & Chute Co., Chicago
Spears-Wells Mchy. Co., Oakland, Cal.
Specialty Engineering Co., Philadelphia, Pa.
Star Drilling Mach. Co., Akron, Ohio
Universal Rd. Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago

LOCKERS, STEEL
All-Steel Equip. Co., Aurora, Ill.
Berger Mfg. Co., Canton, Ohio
Durabilt Steel Locker Co., Aurora, Ill.
Durand Steel Locker Co., Chicago
Hart & Hutchinson Co., N. Britain, Conn.
Lyon Metallic Mfg. Co., Aurora, Ill.
Fred. Medart Mfg. Co., St. Louis, Mo.
Narragansett Mach. Co., Providence, R. I.

LOCOMOTIVES, FOR CONTRACTORS, ETC.
*Brookville Locomotive Co., Brookville, Pa.
Baldwin Loc. Works, Philadelphia, Pa.
Davenport Loc. Works, Davenport, Iowa
Fate-Root-Heath Co., Plymouth, Ohio
Heisler Locomotive Works, Erie, Pa.
Lima Loc. Works, Lima, Ohio
Mid-West Locomotive Works, Cincinnati
Milwaukee Loc. Mfg. Co., Milwaukee
H. K. Porter Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Geo. D. Whitcomb Co., Rochelle, Ill.

LUBRICANTS
*D-A Lubricant Co., Indianapolis, Ind.
*Joseph Dixon Crucible Co., Jersey City, N. J.
Texas Co., New York

LUBRICATORS
The Bassick Mfg. Co., Chicago
Carr Fastener Co., Cambridge, Mass.

MANGANESE STEEL PRODUCTS
American Maganese St. Co., Chicago H'ts., Ill.
Taylor-Wharton Ir. & St. Co., High Bridge, N.J.

MANHOLE COVERS (See Castings)

METAL LATH (See Lath)

METAL ROOFING (See Roofing)

METER BOXES
Builders Iron Foundry, Providence, R. I.
H. W. Clark Co., Mattoon, Ill.
Clarksville Fdry. & Mach. Co., Clarksville, Tenn.
J. B. Clow & Sons, Chicago
Columbian Iron Works, Chattanooga, Tenn.
Ford Meter Box Co., Wabash, Ind.
Mueller Co., Decatur, Ill.
J. S. Schofield's Sons Co., Macon, Ga.

METER COUPLINGS
*Neptune Meter Co., New York
H. W. Clark Co., Mattoon, Ill.
Ford Meter Box Co., Wabash, Ind.
Hersey Mfg. Co., So. Boston, Mass.
Mueller Co., Decatur, Ill.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Union Water Meter Co., Worcester, Mass.

METER TESTERS
*Neptune Meter Co., New York
H. W. Clark Co., Mattoon, Ill.
Ford Meter Box Co., Wabash, Ind.
Mueller Co., Decatur, Ill.
National Meter Co., New York
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

METERS, ELECTRIC (WATTHOUR)
Duncan Elec. Mfg. Co., LaFayette, Ind.
General Electric Co., Schenectady, N. Y.
Sangamo Electric Co., Springfield, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

METERS, WATER, OIL & GASOLINE
*Neptune Meter Co., New York
Badger Meter Mfg. Co., Milwaukee
Buffalo Meter Co., Buffalo, N. Y.
Federal Meter Corp., E. Orange, N. J.
Gamon Meter Co., Newark, N. J.
Hersey Mfg. Co., Boston, Mass.
National Meter Co., New York
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Phoenix Meter Co., Prince Bay, St. Isl., N. Y.
Thomson Meter Corp., New York
Union Water Meter Co., Worcester, Mass.
Worthington Pump & Mchy. Corp., New York

METERS, WATER (VENTURI TYPE)
Builders Iron Fdry., Providence, R. I.
Simplex Valve & Meter Co., Philadelphia, Pa.

MIXERS, CONCRETE (See Concrete Mixers)

MIXERS, GROUT
*Lakewood Eng. Co., Cleveland, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Kent Mach. Co., Cuyahoga Falls, Ohio
T. L. Smith Co., Milwaukee, Wis.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

Digging Power—

ability to go right into solid ground, rip it out and put the spoil up into the truck without destructive strains on the machinery,—is characteristic of

The NELSON Q-7 LOADER

on McCormick Tractor

The continuous spiral feeders make digging a continuous operation with the shocks smoothed out into a steady continuous flow of power from the engine to feeder, resulting in—

LESS WEAR and TEAR,
LESS TIME OUT,
LONGER LIFE

Ask us about it

AMERICAN ROAD BUILDERS' ASSOCIATION
1930 CONVENTION AND ROAD SHOW
JAN. 13–18
ATLANTIC CITY N.J

The N. P. NELSON IRON WORKS, Inc.
822 Bloomfield Avenue :: :: Passaic, N. J.

Where to Purchase

MIXERS, MORTAR

*Atlas Engineering Co., Clintonville, Wis.
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Heltzel St. Form & Ir. Co., Warren, Ohio
*Jaeger Machine Co., Columbus, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*John Lauson Mfg. Co., New Holstein, Wis.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Anchor Mfg. Co., Chicago
Archer Iron Works, Chicago
Blystone Mfg. Co., Cambridge Spgs., Pa.
Construction Machy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
Kent Machine Co., Kent, Ohio
Kiel Machine Co., Kiel, Wis.
Knickerbocker Co., Jackson, Mich.
Meili-Blumberg Co., New Holstein, Wis.
T. L. Smith Co., Milwaukee, Wis.
Standard Scale & Sup. Corp., Pittsburgh
Talbot-Flood Mfg. Co., Kansas City, Mo.

MIXERS, PLASTER

*Atlas Engineering Co., Clintonville, Wis.
*Conveying Weigher Co., N. Y.
*Jaeger Machine Co., Columbus, Ohio
*John Lauson Mfg. Co., New Holstein, Wis.
Anchor Mfg. Co., Chicago
Blystone Mfg. Co., Cambridge Spgs., Pa.
Construction Machy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
Essick & Co., Los Angeles, Cal.
Knickerbocker Co., Jackson, Mich.
Meili-Blumberg Co., New Holstein, Wis.
Standard Scale & Sup. Corp., Pittsburgh
Talbot-Flood Mfg. Co., Kansas City, Mo.

MORTAR BOXES

*Blaw-Knox Co., Pittsburgh, Pa.
*General Wheelbarrow Co., Cleveland, Ohio
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Jos. Honhorst Co., Cincinnati, Ohio
Anchor Mfg. Co., Chicago, Ill.
Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
Canton Art Metal Co., Canton, Ohio
Norris K. Davis, San Francisco, Calif.
Donley Bros. Co., Cleveland, O.
Empire Metal Tank Wks., E. Rochester, N. Y.
Littleford Bros., Cincinnati

MOTORCYCLES

Cleveland Motorcycle Co., Cleveland, Ohio
Excelsior Motor Mfg. & Supply Co., Chicago
Harley-Davidson Motor Co., Milwaukee
Indian Motocycle Co., Springfield, Mass.

MOTORS, GASOLINE (See Engines, Gas and Gasoline)

MOTOR TRUCKS

*Dodge Bros., Detroit
*International Harvester Co., Chicago
Acme Motor Truck Co., Cadillac, Mich.
Amer.-La France & Foamite Corp., New York
Atterbury Motor Car Co., Buffalo, N. Y.
Autocar Co., Ardmore, Pa.
Brockway Motor Truck Co., Cortland, N. Y.
Clydesdale Motor Truck Co., Clyde, Ohio
Diamond T. Motor Car Co., Chicago
Duplex Truck Co., Lansing, Mich.
Federal Motor Truck Co., Detroit
Ford Motor Co., Detroit
Four Wheel Drive Auto Co., Clintonville, Wis.
General Motors Truck Co., Chicago
Gramm Motors, Inc., Lima, Ohio
The Hug Co., Highland, Ill.
Indiana Truck Corp., Marion, Ind.
Larabee-Duyo Motor Tr. Co., Binghamton, N.Y.
Laedinghaus-Espenschied Wagon Co., St. Louis
Mack Trucks, Inc., New York
Pierce-Arrow Motor Car Co., Buffalo
Reo Motor Car Co., Lansing, Mich.
Standard Motor Truck Co., Detroit
Sterling Motor Truck Co., Milwaukee
Stewart Motor Corp., Buffalo, N. Y.
Traffic Motor Tr. Co., St. Louis, Mo.
Walter Motor Truck Co., L. I. City, N. Y.
White Co., Cleveland, Ohio
Yellow Truck & Coach Mfg. Co., Chicago

MOULDS, CONCRETE

*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio

MUCKING, MACHINES

Hoar Shovel Co., Duluth, Minn.

NUMBERS, HOUSE (See House Numbers)

OILS, ROAD

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., N. Y.
*Standard Oil Co. (Indiana), Chicago
*Standard Oil Co. (N. Y.), N. Y.
Atl. Ref. & Asph. Corp., Philadelphia, Pa.
Headley Good Roads Co., Philadelphia, Pa.
Pioneer Asph. Co., Lawrenceville, Ill.
Standard Oil Co. (La.), N. Orleans, La.
Standard Oil Co. (N. J.), Newark, N. J.
Texas Company, N. Y.

OXY-ACETYLENE APPARATUS

*Oxweld Acetylene Co., Long Island City, N. Y.
Alex. Milburn Co., Baltimore, Md.

PACKING, WATER PIPE

The Leadite Co., Philadelphia, Pa.
United Lead Company, N. Y.

PAINTING MACHINERY

Binks Spray Equipment Co., Chicago
Chicago Pneumatic Tool Co., New York
De Vilbiss Mfg. Co., Toledo, Ohio
Eclipse Air Brush Co., Newark, N. J.
Hobart Brothers Co., Troy, Ohio
W. N. Matthews Corp., St. Louis
Alex. Milburn Co., Baltimore, Md.
Passche Air Brush Co., Chicago
Simons Paint Spray Brush Co., Dayton, Ohio
Spraco Painting Equip. Co., Boston

PAINTS, METAL PROTECTION

*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
*Carey Co., Philip, Cincinnati
*Jos. Dixon Crucible Co., Jersey City, N. J.
*McEverlast, Inc., Los Angeles, Calif.
*Solvay Sales Corp., New York
Acme White Lead & Color Works, Detroit
Berry Bros., Detroit
Cook Paint & Varnish Co., Kansas City, Mo.
Detroit Graphite Co., Detroit
Detroit White Lead Works, Detroit
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Euclid Chemical Co., Cleveland, Ohio
Hoosier Paint Works, Ft. Wayne, Ind.
Minwax Co., N. Y.
Protexol Corp., Kenilworth, N. J.
Ruberoid Co., N. Y.
Servicised Products Corp., Chicago
Sherwin-Williams Co., Cleveland, Ohio
L. Sonneborn Sons, N. Y.
Tech Brothers, N. Y.
Tropical Paint & Oil Co., Cleveland, Ohio
Truscon Laboratories, Detroit

PARK BENCHES

Logan Co., Louisville, Ky.
Fred J. Meyers Mfg. Co., Hamilton, Ohio
Millersville Supply Co., Millersville, Pa.
Stewart Iron Works Co., Cincinnati, Ohio
Van Dorn Iron Works Co., Cleveland

PAVEMENT BREAKERS (See Breakers)

PAVERS, CONCRETE

*Jaeger Mach. Co., Columbus, Ohio
*Koehring Co., Milwaukee
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Chain Belt Co., Milwaukee
Foote Co., Nunda, N. Y.
T. L. Smith Co., Milwaukee

PAVING AND ROAD ROLLERS (See Road and Paving Rollers)

PAVING BLOCKS, CREOSOTED WOOD (See Creosoted Blocks)

PAVING BRICK

Alton Brick Co., Alton, Ill.
Buckeye Shale Brick Co., Cleveland, Ohio
Buffalo Brick Co., Buffalo, Kans.
Cleveland Brick & Clay Co., Cleveland, Ohio
Collinwood Shale Brick Co., Cleveland, Ohio
Corry Brick & Tile Corp., Corry, Pa.
Crescent Brick Co., Pittsburgh, Pa.
Euclid Shale Brick Co., Cleveland, Ohio
Georgia Vit. Brick Co., Augusta, Ga.
Globe Brick Co., E. Liverpool, Ohio
Hammond Fire Brick Co., Fairmount, W. Va.
Hisylvania Coal Co., Columbus, Ohio
Hocking Valley Brick Co., Columbus, Ohio
McAvoy Brick Co., Bridgeville, Pa.
Mayer Brick Co., Bridgeville, Pa.
Metropolis Paving Brick Co., Pittsburgh, Kans.
Metropolitan Paving Brick Co., Canton, Ohio
Mineral Wells Brick Co., Mineral Wells, Tex.
Moberly Paving Brick Co., Moberley, Mo.
Murphysboro Paving Brick Co., Murphysboro, Ill.
Nelson Brick Co., Nelsonville, Ohio
Nelsonville Brick Co., Columbus, Ohio
Patton Clay Mfg. Co., Patton, Pa.
Paxton Brick Co., Watsontown, Pa.
Peebles Paving Brick Co., Portsmouth, Ohio
Peoria Brick & Tile Co., Peoria, Ill.
Parington Paving Brick Co., Galesburg, Ill.
Rose Shale Brick Co., Vedersburg, Ill.
Russell Clay Mfg. Co., Alton, Ala.
So. Clay Mfg., Chattanooga, Tenn.
Springfield Paving Brick, Springfield, Ill.
Sterling Brick Co., Olean, N. Y.
Streator Clay Mfg. Co., Streator, Ill.
Terra Haute Vit. Brick Co., Terre Haute, Ind.
Thornton Fire Brick Co., Clarksburg, W. Va.
Thurber Brick Co., Thurber, Tex.
Toronto Fire Clay Co., Toronto, Ohio
Trinidad Brick & Tile Co., Trinidad, Colo.
United Clay Products Corp., Kansas City
Western Shale Products Co., Ft. Scott, Kans.
Westport Paving Brick Co., Westport, Md.

PAVING GUARDS, STEEL

W. S. Godwin Co., Baltimore, Md.

PAVING MACHINERY (See Road and Paving Machinery)

PAVING MATERIALS (See "Asphalt," "Paving Brick," "Granite Block," etc.)

PAVING MIXERS (See Concrete Mixers)

PAVING TOOLS

*Barber Asphalt Co., Philadelphia, Pa.
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Jos Honhorst Co., Cincinnati, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Ascoil Burner Co., West New York, N. J.
W. H. Anderson Tool & Supply Co., Detroit
F. D. Cummer & Sons Co., Cleveland, Ohio
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros. Co., Cincinnati, Ohio
Warren Bros. Co., Boston

PICKS

Hubbard Co., Pittsburgh, Pa
Iron City Tool Works, Pittsburgh
Klein-Logan Co., Pittsburgh
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Verona Tool Works, Verona, Pa.
Warren Tool & Forge Co., Warren, Ohio
Warwood Tool Co., Wheeling, W. Va.
Wyoming Shovel Works, Wyoming, Pa.

PILE DRIVERS

*Brown Clutch Co., Sandusky, Ohio
*Bucyrus-Erie Co., Erie, Pa.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Brownhoist Corp., Cleveland
*McKiernan-Terry Corp., N. Y.
*Union Iron Works, Inc., Hoboken, N. J.
Lidgerwood Mfg. Co., Elizabeth, N. J.
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., East Boston

PILE-HAMMERS, STEAM

*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Brownhoist Corp., Cleveland
*McKiernan-Terry Corp., N. Y.
*Union Iron Works, Inc., Hoboken, N. J.
*Wemlinger, Inc., N. Y.
National Hoisting Engine Co., Harrison, N. J.
Vulcan Iron Works, Chicago

PILING, CONCRETE

MacArthur Conc. Pile & F'd'n Co., N. Y.
Raymond Concrete Pile Co., N. Y.

PILING, INTERLOCKING STEEL

*Wemlinger, Inc., New York
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh

PILING, STEEL SHEET

*Wemlinger, Inc., New York
Bethlehem Steel Co., Bethlehem, Pa.

PIPE, CAST IRON

*Central Foundry Co., N. Y.
*U. S. Pipe & Foundry Co., Burlington, N. J.
Am. Cast Iron Pipe Co., Birmingham, Ala.
J. B. Clow & Sons, Chicago
Donaldson Iron Co., Emaus, Pa.
John Fox & Co., N. Y.
Glamorgan Pipe & F'dry Co., Lynchburg, Va.
Lynchburg F'dry Co., Lynchburg, Va.
McWane Cast Iron Pipe Co., Birmingham, Ala.
National Cast Iron Pipe Co., Birmingham, Ala.
Warren Foundry & Pipe Co., N. Y.
R. D. Wood & Co., Philadelphia, Pa.

PIPE, CULVERT (See Culverts)

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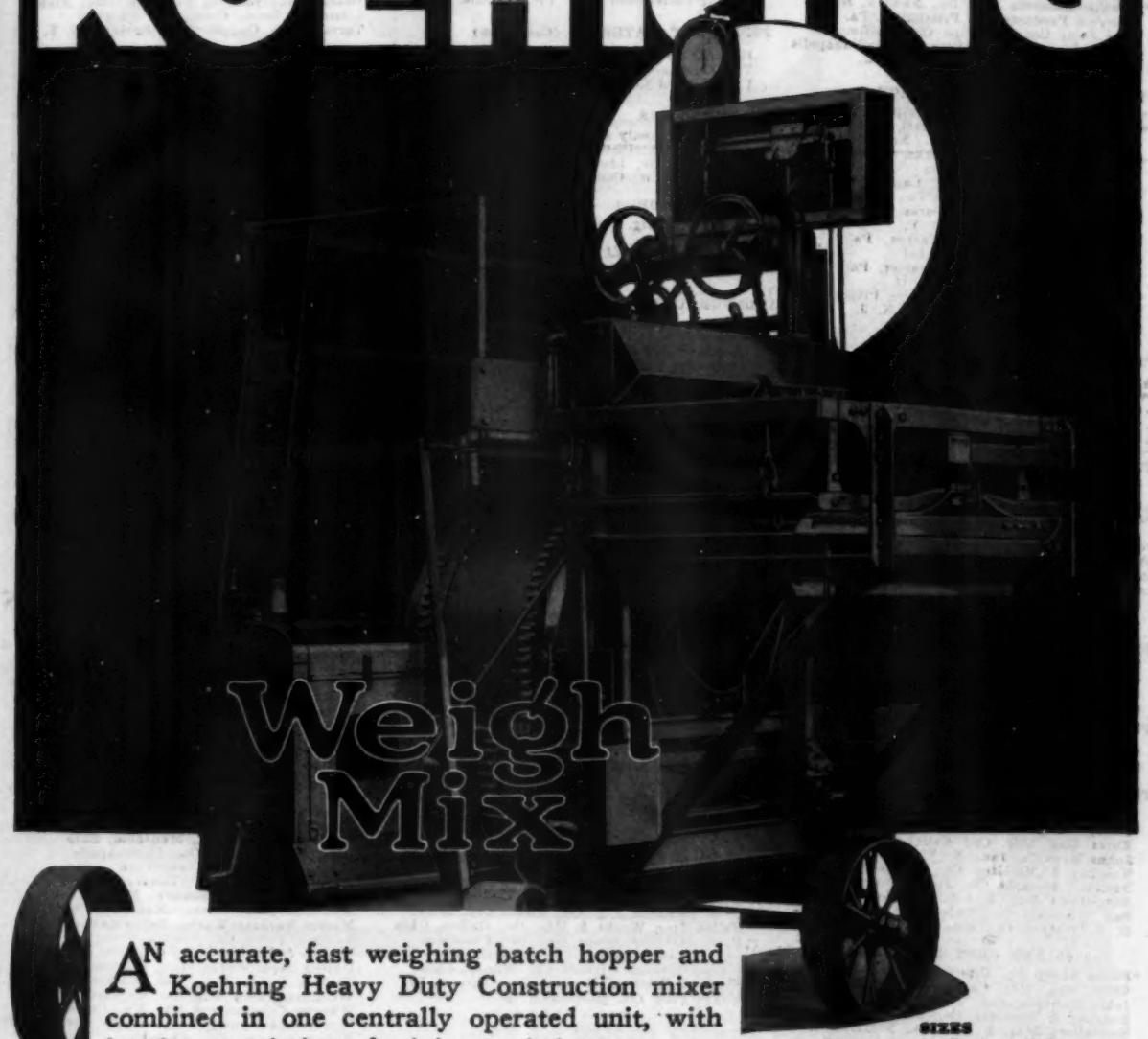
KOEHRING



AN accurate, fast weighing batch hopper and Koehring Heavy Duty Construction mixer combined in one centrally operated unit, with batchmeter timing of mixing period.

All materials weighed in one batch hopper, allowing for use of as many grades of aggregate as desired!

One operator easily weighs materials at speed to utilize full mixing capacity of the mixer!

Hopper door actuates batchmeter. Hopper shaking device quickly cleans hopper so that scales return to balance for weighing next batch.

More compact—more practical in control and installation than separate weighing units. Write for special literature on Koehring Weigh Mix.

SIZES

Pavers — 27-E six cylinder Waukesha engine, automatic operations. 13-E four cylinder Waukesha engine. Comply with A. G. C. standards.

Subgrade Planers — Built for all types of roadway, 8' to 27' widths; attachable to 27-E Paver.

Construction Mixers—14-S, 21-S, 28-S. Trucks or skids; rubber tires optional. 28-S skids only. Weigh Mix attachments on 14-S. Comply with A. G. C. standards.

Dandie Mixers—5-S, 7-S, 10-S. 5-S single or four cylinder, 7-S two or four cylinder, 10-S four cylinder gasoline engine. Charging skip or low charging hopper and platform. Rubber tired or steel rimmed wheels. Comply with A. G. C. standards.

Division of National Equipment Corporation

KOEHRING COMPANY MILWAUKEE, WISCONSIN

PAVERS, MIXERS—GASOLINE SHOVELS, PULL SHOVELS, CRANES AND DRAGLINES

Sales Offices and Service Warehouses in all principal cities

Foreign Department, Room 579, 50 Church Street, New York City

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Where to Purchase

PIPE, LEAD
United Lead Company, N. Y.

PIPE, REINFORCED CONCRETE
*Newark Concrete Pipe Co., Newark, N. J.
Concrete Products Co., Pittsburgh, Pa.
Core Joint Concrete Pipe Co., Baltimore
Independent Concrete Pipe Co., Indianapolis
Lock Joint Pipe Co., Ampere, N. J.

PIPE, RIVETED STEEL OR IRON
*Gumery & Co., Inc., Philadelphia, Pa.
*Jos. Meuhorst Co., Cincinnati, O.
Abendroth & Root Mfg. Co., Newburgh, N. Y.
American Spiral Pipe Works, Chicago
Biggs Boiler Works, Akron
Canton Culvert & Silo Co., Canton, O.
Chattanooga Boiler & Tank Co., Chatta., Tenn.
Chicago Bridge & Iron Works, Chicago
East Jersey Pipe Co., N. Y.
Hammond Iron Works, Warren, Pa.
R. Hardesty Mfg. Co., Denver
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, O.
Pittsburgh-Des Moines Steel Co., Pittsb'h, Pa.
Tippett & Wood, Phillipsburg, N. J.
Weller Mfg. Co., Chicago

PIPE, STEEL
Central Tube Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh
National Tube Co., Pittsburgh
Republic Iron & Steel Co., Youngstown, O.
South Chester Tube Co., Chester, Pa.
Spang-Chalfont & Co., Pittsburgh, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, WOOD
American Wood Pipe Co., Tacoma, Wash.
Federal Tank & Pipe Co., Seattle, Wash.
Michigan Pipe Co., Bay City, Mich.
Pacific Pipe & Tank Co., San Francisco
Redwood Mfrs. Co., San Francisco
Standard Wood Pipe Co., Williamsport, Pa.
A. Wyckoff & Sons Co., Elmira, N. Y.

PIPE, WROUGHT IRON
A. M. Byers Co., Pittsburgh, Pa.
Cohoes Rolling Mill Co., Cohoes, N. Y.
Reading Iron Co., Reading, Pa.

PIPE BENDING MACHINES
American Pipe Bending Mach. Co., Boston
Watson-Stillman Co., New York

PIPE COVERING

AIRCELL

*Philip Carey Co., Cincinnati, Ohio
Ehret Mag. Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
National Asbestos Co., Jersey City, N. J.
Norristown Mag. & Asb. Co., Norristown, Pa.
Sall Mountain Co., Chicago
H. F. Watson Co., Erie, Pa.

85 PER CENT MAGNESIA

*Philip Carey Co., Cincinnati, Ohio
Ehret Mag. Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Norristown Mag. & Asb. Co., Norristown, Pa.

WOOD

Redwood Mfrs. Co., San Francisco
A. Wyckoff & Son Co., Elmira, N. Y.

PIPE CUTTERS (See Cutters, Pipe, Head)

PIPE FITTINGS
*Central Foundry Co., N. Y.
*U. S. Pipe & Foundry Co., Burlington, N. J.
American Cast Iron Co., Birmingham, Ala.
Builders Iron Foundry, Providence, R. I.
J. B. Clow & Sons, Chicago
Crane Co., Chicago
Donaldson Iron Co., Emaus, Pa.
Lunkenheimer Co., Cincinnati, O.
Nti. C. I. Pipe Co., Birmingham, Ala.
Reading Steel Casting Co., Inc., Bridgeport, Conn.
Warren Foundry & Pipe Co., N. Y.
R. D. Wood & Co., Philadelphia, Pa.

PIPE HANDLING MACHINERY
Taylor Portable Steel Derrick Co., Chicago

PIPE TAPPING MACHINERY (See Water Main Tapping)

PIPE JOINT COMPOUND (Sewer)
*Philip Carey Co., Cincinnati, Ohio
*Jos. Dixon Crucible Co., Jersey City, N. J.
Atlas Mineral Prod. Co., Mertztown, Pa.
The Leadite Co., Philadelphia, Pa.
Pacific Flush Tank Co., Chicago and N. Y.
Ruberoid Co., New York
Texas Co., New York
Waring-Underwood Co., Philadelphia, Pa.

PIPE JOINT MATERIAL (Cast Iron)
Hydraulic Development Co., Boston
The Leadite Co., Philadelphia, Pa.
United Lead Co., New York

PIPE PUSHERS
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh
Easy Mfg. Co., Lincoln, Neb.
Giant Mfg. Co., Council Bluffs, Ia.

PIPE THREADERS
Armstrong Mfg. Co., Bridgeport, Conn.

PLANERS, PNEUMATIC
Tousley Tool Co., Cleveland, Ohio

PLAYGROUND APPARATUS
American Playground Device Co., Anderson, Ind.
Chicago Gymnasium Equipment Co., Chicago
Everwear Mfg. Co., Springfield, O.
Giant Mfg. Co., Council Bluffs, Ia.
Hill-Standard Co., Anderson, Ind.
R. F. Lamar & Co., Pueblo, Colo.
Fred. Medart Mfg. Co., St. Louis, Mo.
Mitchell Mfg. Co., Milwaukee
Patterson-Williams Co., San Jose, Calif.
A. G. Spalding & Bros., Chicopee, Mass.

PLOWS, CONTRACTORS'
*Austin-Western Road Mach. Co., Chicago
*Caterpillar Trac. Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
*International Harvester Co., Chicago
*Roderick Lean Mfg. Co., Mansfield, O.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, O.
Deere & Co., Moline, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
Moline Implement Co., Moline, Ill.
Oliver Chilled Plow Works, South Bend, Ind.
Sidney Steel Scraper Co., Sidney, O.
Slusser-McLean Scraper Co., Sidney, O.
Western Wheeled Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

PLOWS, ROAD AND RooTER
*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*General Wheelbarrow Co., Cleveland
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
Ted Carr & Co., Chicago
Deere & Co., Moline, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
P. B. Hackley Equip. Co., San Francisco
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Western Wheeled Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

PLUMBING SUPPLIES
J. B. Clow & Sons, Chicago
Crane Co., Chicago
Glauber Brass Mfg. Co., Cleveland, O.
J. L. Mott Iron Works, N. Y.
Mueller Company, Decatur, Ill.
Rundle-Spence Mfg. Co., Milwaukee
Walworth Mfg. Co., Boston

PNEUMATIC CONCRETE PLACERS
*Ransome Concrete Machinery Co., Dunellen, N. J.
Cement-Gun Co., Inc., Allentown, Pa.

PNEUMATIC GROUT MIXERS & PLACERS
*Ransome Concrete Machinery Co., Dunellen, N. J.
Cement-Gun Co., Inc., Allentown, Pa.

PORTABLE BUILDINGS
*Blaw-Knox Co., Pittsburgh, Pa.
*Truscon Steel Co., Youngstown, O.
Littleford Bros., Cincinnati, O.

PORTABLE STEEL DERRICKS (See Derricks, Steel Portable)

PORTABLE WOOD WORKERS
*American Saw Mill Machinery Co., Hackettstown, N. J.
Jaeger Portable Power Corp., Detroit
Jones Superior Machine Co., Chicago

PORTLAND CEMENT (See Cement)

POTS, ASPHALT AND TAR, POURING
*Barber Asphalt Co., Philadelphia, Pa.
Acme Road Machinery Co., Frankfort, N. Y.
Beach Manufacturing Co., Charlotte, Mich.
Littleford Bros., Cincinnati, Ohio
Tarrent Mfg. Co., Saratoga Springs, N. Y.

POWDER (See Explosives)

POWER PLANTS, INDUSTRIAL
*Continental Motors Corp., Muskegon, Mich.
*Hercules Motors Corp., Canton, O.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Waukesha Motor Co., Waukesha, Wis.
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Buda Co., Harvey, Ill.
Climax Engine Co., Clinton, Iowa
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Servel Mfg. Co., Evansville, Ind
Wisconsin Motor Co., Milwaukee, Wis.

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*Clyde Iron Works Sales Co., Duluth, Minn.
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Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York

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*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Evinrude Motor Division, Milwaukee, Wis.
*Homelite Corp., Port Chester, N. Y.
*La Bour Co., Chicago Heights, Ill.
*Nove Engine Co., Lansing, Mich.
Aldrich Pump Co., Allentown, Pa.
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
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Buffalo Steam Pump Co., Buffalo, N. Y.
A. S. Cameron Steam Pump Works, New York
Chain Belt Co., Milwaukee
Chicago Pump Co., Chicago
Cook Motor Co., Delaware, O.
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Fairbanks, Morse & Co., Chicago
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LeCourtenay Co., Newark, N. J.
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United Iron Works, Inc., Kansas City, Mo.
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*Union Iron Works, Hoboken, N. J.
*Waukesha Motor Co., Waukesha, Wis.
Aldrich Pump Co., Allentown, Pa.
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, Ohio
Buda Co., Harvey, Ill.
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Deming Co., Salem, O.
Emerson Pump & Valve Co., Alexandria, Va.
Erie Pump & Engine Works, Medina, N. Y.
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Barnes Mfg. Co., Mansfield, O.
Chain Belt Co., Milwaukee, Wis.
Deming Co., Salem, Ohio
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Goulds Pumps, Inc., Seneca Falls, N. Y.
Humphyres Mfg. Co., Mansfield, Ohio
Trench & Marine Pump Co., New York
Waldo Bros. & Bond Co., Boston, Mass.
Witte Engine Works, Kansas City, Mo.

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Morris Machine Works, Baldwinsville, N. Y.
Trench & Marine Pump Co., New York

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*Nove Engine Co., Lansing, Mich.
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American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
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Goulds Pumps, Inc., Seneca Falls, N. Y.
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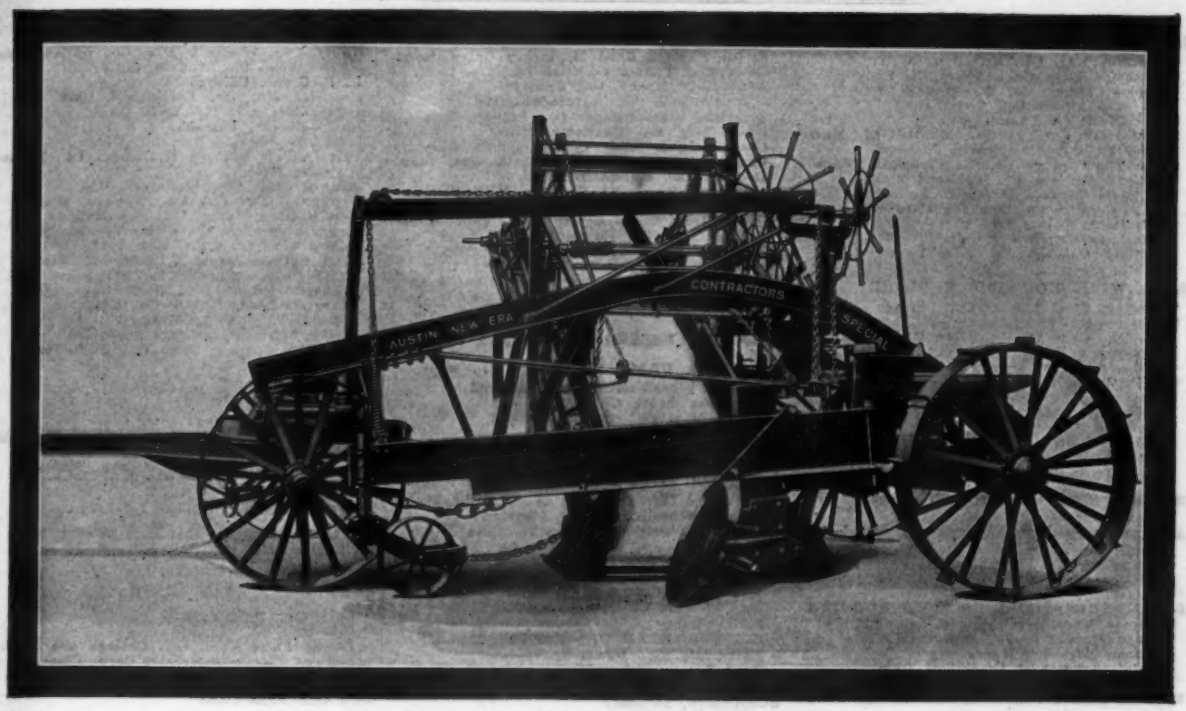

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Atlas Scraper Co., Los Angeles, Calif.
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Case Crane & Engg. Co., Columbus, Ohio
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General Wheelbarrow Co., Cleveland, Ohio
Killefer Mfg. Corp., Los Angeles
Lyle Culvert & Road Equip. Co., Minneapolis
Miskin Scraper Works, Ucon, Idaho
Root Spring Scraper Co., Kalamazoo
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Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
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Stockland Road Machy. Co., Minneapolis, Minn.
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*General Wheelbarrow Co., Cleveland
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J. D. Adams & Co., Indianapolis, Ind.
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Atlas Scraper Co., Los Angeles, Calif.
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
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LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
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W. A. Riddell Co., Bucyrus, Ohio
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
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Smith Engineering Works, Milwaukee, Wis.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Machine Co., Kingston, N. Y.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
Wickwire Spencer Steel Co., New York

SCREENS, SEWAGE
Dorr Co., New York
Green Bay Fdry. & Mach. Wks., Green Bay, Wis.
Link-Belt Co., Chicago
Simplex Ejector & Aerator Corp., Chicago

SEWAGE DISINFECTION
*Wallace & Tiernan Co., Inc., Newark, N. J.
Paradon Mfg. Co., Arlington, N. J.

SEWAGE DISPOSAL APPARATUS
Dorr Co., New York
Link-Belt Co., Chicago
Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago

SEWAGE EJECTORS
Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago
Yeomans Bros. Co., Chicago

SEWAGE PUMPS (See Pumps)

SEWER BLOCKS, SEGMENT
American Vit. Products Co., Akron, Ohio
Cannelton Sewer Pipe Co., Cannelton, Ind.
Denver Sewer Pipe & Clay Co., Denver, Col.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evens & Howard Fire Brick Co., St. Louis, Mo.
Laclede Christy Clay Prod. Co., St. Louis, Mo.
Macomb Sewer Pipe Works, Macomb, Ill.
Pacific Clay Products Co., Los Angeles, Cal.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Products Co., Akron, Ohio
Standard Fire Brick & Sewer Pipe Co., Pueblo, Col.

SEWER BRACES
*Templeton, Kenly & Co., Chicago

SEWER CLEANING APPARATUS
F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Hepco Sewer Root Cutter Co., Freeport, Ill.
Self Propelling Nozzle Co., New York
Turbine Sewer Machine Co., Milwaukee

SEWER PIPE AND DRAIN TILE
American Vit. Products Co., Akron, Ohio
Blackmer & Post Pipe Co., St. Louis
William E. Dee Co., Chicago
Denver Sewer Pipe & Clay Co., Denver, Colo.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evens & Howard Fire Brick Co., St. Louis
Logan Clay Products Co., Logan, Ohio
Ohio Vit. Pipe Co., Uhrichsville, Ohio
Patton Clay Mfg. Co., Patton, Pa.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Prod. Co., Akron, Ohio
Streator Clay Mfg. Co., Streator, Ill.

SEWER PIPE FORMS (See Forms, Concrete Pipe)

SEWER PIPE JOINT COMPOUNDS
Atlas Mineral Prod. Co., Mertztown, Pa.
Pacific Flush Tank Co., Chicago and N. Y.
Ruberoid Co., New York
Servicised Products Corp., Chicago
Cone. Form Co., Inc., Syracuse, N. Y.
Quinn Wire & Iron Works, Boone, Iowa

SEWER RODS
F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Turbine Sewer Machine Co., Milwaukee

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Where to Purchase

SHARPENERS, DRILL STEEL
*Sullivan Machinery Co., Chicago
Gardner-Denver Co., Quincy, Ill.
Hardsoog Wonder Drill Co., Ottumwa, Iowa
Ingersoll-Rand Co., New York

SHORES
Concrete Engineering Co., Omaha, Neb.
Dayton Sure Grip & Shore Co., Dayton, Ohio
Fischer & Hayes Rope & Steel Co., Chicago
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
H. W. Roos Co., Cincinnati, Ohio
Roos-Meyer-Hecht Co., Cincinnati, Ohio
Symons Clamp & Mfg. Co., Chicago
Universal Form Clamp Co., Chicago

SHOVELS, CRAWLING TRACTOR
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
American Hoist & Derrick Co., St. Paul
Ohio Power Shovel Co., Lima, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa

SHOVELS, ELECTRIC
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Byers Mach. Co., Ravenna, Ohio
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
Ohio Power Shovel Co., Lima, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa

SHOVELS, GASOLINE
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Insley Mfg. Co., Indianapolis
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
American Hoist & Derrick Co., St. Paul
American Steel Dredge Co., Ft. Wayne, Ind.
Austin Machine Corp., Muskegon, Mich.
Byers Mach. Co., Ravenna, Ohio
General Excavator Co., Marion, Ohio
Harnischfeger Corp., Milwaukee, Wis.
Keystone Driller Co., Beaver Falls, Pa.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., Boston
Northwest Engineering Works, Chicago
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Speeder Mchy. Corp., Cedar Rapids, Iowa
Star Drilling Machine Co., Akron, Ohio
Universal Power Shovel Co., Highland Park, Mich.

SHOVELS, STEAM
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Marion Steam Shovel Co., Marion, Ohio
Orton Crane & Shovel Co., Chicago
Keystone Driller Co., Beaver Falls, Pa.

SHOVELS, SPADES AND SCOOPS
American Mfg. Co., Chattanooga, Tenn.
Ames Shovel & Tool Co., Boston
Baldwin Tool Works, Parkersburg, W. Va.
Beall Bros. Co., Alton, Ill.
Connecut Shovel Co., Connecut, Ohio
Indiana Shovel Co., New Castle, Ind.
Jackson Shovel Co., Montpelier, Ind.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Wood Shovel & Tool Co., Piqua, Ohio
Wyoming Shovel Works, Wyoming, Pa.

SIDEWALK AND ROAD FORMS (See Forms, Concrete)

SIGNS, STREET AND ROAD
Almoyd Sign & Signal Co., Chicago
Auto Sign Display Co. of Missouri, St. Louis, Mo.
Baltimore Enamel & Novelty Co., Baltimore
Elkhart Foundry & Machine Co., Elkhart, Ind.
Everna-Century Sign Co., Boston
Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
A. D. Joslin Mfg. Co., Manistee, Mich.
Lyle-Signs, Minneapolis, Minn.
Municipal Street Sign Co., New York
Niles Machine Co., Lebanon, N. H.
Persons-Majestic Mfg. Co., Worcester, Mass.
Redflex Signal Co., Cleveland, Ohio
Rochester Street Signal Co., Rochester, N. Y.
Standard Mfg. Co., Cedar Falls, Iowa
Union Iron Products Co., E. Chicago, Ind.
Western Stamping & Mfg. Co., St. Paul

SLEEVES, TAPPING AND VALVE
Mueller Company, Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., East Orange, N. J.

SLUICE GATES (See Gates, Sluice)

SMOKE STACKS (See Chimneys, Steel)

SNOW REMOVAL MACHINERY
*Allis-Chalmers Mfg. Co., Springfield, Ill.
*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Barber-Greene Co., Aurora, Ill.
*Caterpillar Tractor Co., San Leandro, Cal.
*Cleveland Tractor Co., Cleveland, Ohio
*Good Roads Machinery Co., Kennett Sq., Pa.
*George Haiss Mfg. Co., New York
*M. P. Nelson Iron Works, Passaic, N. J.
*Trackson Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago
Byers Mach. Co., Ravenna, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Fox Rotary Snow Broom Co., New York
Carl H. Frink, Thousand Islands, N. Y.
The Heil Company, Milwaukee, Wis.
Killefer Mfg. Co., Los Angeles, Calif.
Klauer Mfg. Co., Dubuque, Iowa
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Mack Trucks, Inc., New York
Maine Steel Products Co., So. Portland, Me.
Mead-Morrison Mfg. Co., E. Boston
New England Road Machy. Co., So. Boston, Mass.
Owensboro Ditcher & Grader Co, Owensboro, Ky.
W. A. Riddell Co., Bucyrus, Ohio
Rotary Snow Plow Co., Minneapolis
Walsh's Holyoke St. Rlr. Works, Holyoke, Mass.
Walter Snow Fighters, L. I. City, N. Y.
Wausau Iron Wks., Wausau, Wis.

SNOW FENCING
*Good Roads Machinery Co., Kennett Sq., Pa.
American Fence Const. Co., New York
Wickwire-Spencer Steel Co., New York

SPADES (See Shovels)

SPRAYERS, ASPHALT AND TAR
Kinney Mfg. Co., Boston
Littleford Bros., Cincinnati

SPRAYING MACHINERY FOR TREES
John Bean Mfg. Co., Lansing, Mich.
Deming Co., Salem, Ohio
Field Force Pump Co., Elmira, N. Y.
Fitzhenry-Guptill Co., E. Cambridge, Mass.
Friend Mfg. Co., Gasport, N. Y.
Hardie Mfg. Co., Hudson, Mich.

SPRAY PAINTING MACHINERY (See Painting Machinery)

SPREADERS, SAND
*Good Roads Machy. Co., Kennett Square, Pa.
Goroco Mechanical Spreader Co., Philadelphia
Highway Service Co., New Bedford, Mass.
Tarrant Co., Saratoga Springs, N. Y.
Warren Bros. Co., Boston, Mass.

SPREADERS, STONE
*Austin-Western Road Machinery Co., Chicago
*The Burch Corp., Crestline, Ohio
Galion Iron Works & Mfg. Co., Galion, Ohio
Shaw-Enochs Tractor Co., Minneapolis
Universal Road Machinery Co., Kingston, N. Y.

STACKS, STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Inc., Philadelphia
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Joseph Honhorst Co., Cincinnati, Ohio
Birmingham Tank Co., Birmingham, Ala.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., Chicago
Heil Co., Milwaukee, Wis.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
New York Central Iron Works Co., Inc., Hagerstown, Md.
Tippett & Wood, Phillipsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

STANDPIPES AND ELEVATED TANKS
W. E. Caldwell Co., Louisville, Ky.
Chatta. Blr. & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
R. D. Cole Mfg. Co., Newnan, Ga.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Lancaster Iron Works, Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
J. S. Schofield's Sons Co., Macon, Ga.
Tippett & Wood, Phillipsburg, Pa.
United Iron Works, Inc., Kansas City, Mo.

STEAM SHOVELS (See Shovels, Steam)

STEEL PLATE CONSTRUCTION
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Philadelphia
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Joseph Honhorst Co., Cincinnati, Ohio
*Union Iron Works, Hoboken, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., East Chicago, Ill.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heil Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
McClintic-Marshall Co., Pittsburgh, Pa.
New York Central Iron Works Co., Inc., Hagerstown, Md.
Pennsylvania Bridge Co., Beaver Falls, Iowa
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

STEEL SHEET PILING
*Wemlinger, Inc., New York

STEEL TOWERS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Engr. Co., Cleveland, O.
*Ransome Conc. Machinery Co., Dunellen, N. J.

STOKERS, MECHANICAL
Babcock & Wilcox Co., New York
Combustion Engineering Corp., New York
Dayton Stoker Co., Dayton, Ohio
Detroit Stoker Co., Detroit
Green Eng. Co., East Chicago, Ind.
Sanford Riley Stoker Co., Worcester, Mass.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

STREET AND ROAD SIGNS (See Signs)

STREET BROOMS
Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio

STREET CLEANERS' CARTS
Durlach Can & Iron Works, Brooklyn, N. Y.
Rochester Can Co., Rochester, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.

STREET FLUSHERS AND SPRINKLERS
*Austin-Western Road Mchy. Co., Chicago
Austin Mfg. Co., Chicago
Autocar Co., Ardmore, Pa.
E. D. Etnyre & Co., Oregon, Ill.
Federal Motor Truck Co., Detroit
Galion Iron Works & Mfg. Co., Galion, Ohio
General Motors Truck Co., Chicago
Heil Co., Milwaukee, Wis.
Charles Hvass & Co., New York
Kinney Mfg. Co., Boston
Mack Trucks, Inc., New York
Municipal Supply Co., South Bend, Ind.
White Co., Cleveland, Ohio
Whitehead & Kales Co., Detroit

STREET LIGHTING EQUIPMENT
*Novo Engine Co., Lansing, Mich.
American Conc. Marbelite Co., Forest Park, Ill.
J. B. Clow & Sons, Chicago
Electric Ry. Equipment Co., Cincinnati, Ohio
Holophane Co., New York
King Mfg. Co., Chicago
Line Material Co., So. Milwaukee, Wis.
J. S. Schofield's Sons Co., Macon, Ga.
Union Metal Mfg. Co., Canton, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

STREET SIGNS (See Signs, Street)

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

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PHILADELPHIA, PA.	420 Commercial Trust Bldg.	BUFFALO, N. Y.	733 Ellicott Square Bldg.

Where to Purchase

STREET SWEEPERS
*Austin-Western Road Mchy. Co., Chicago
Acme Road Machy. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Butler Mfg. Co., Cleveland, Ohio
Elgin Sales Corp., New York
Kinney Mfg. Co., Boston
Whitehead & Kales Co., Detroit

STREET SWEEPER BROOMS REFILLED
Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio
Standard Brush & Broom Mfg. Co., Chicago

STUMP PULLERS
*Roebe Bros., Inc., Seattle, Wash.
H. L. Bennett & Co., Westerville, Ohio
Ernted Mfg. Co. Portland, Ohio
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
John Waldron Corp., New Brunswick, N. J.

SUBGRADING MACHINES
*Blaw-Knox Co., Pittsburgh, Pa.
*Koehring Co., Milwaukee
*Lakewood Eng. Co., Cleveland, Ohio
Ted Carr & Co., Chicago
The Hug Co., Highland, Ill.
Shaw-Enochs Tractor Co., Minneapolis

SURFACERS & GRINDERS, CONCRETE
Chicago Pneumatic Tool Co., New York
Cleveland Pneumatic Tool Co., Cleveland
Concrete Surfacing Machy. Co., Cincinnati
The Dallett Co., Philadelphia
Ingersoll-Rand Co., New York
Tousley Tool Co., Cleveland

SURVEYORS' INSTRUMENTS (See Instruments)

SWITCHBOARDS
*Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Wagner Electric Mfg. Co., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TAMPERS, PNEUMATIC
Chicago Pneumatic Tool Co., New York
Ingersoll-Rand Co., New York
Independent Pneumatic Tool Co., Chicago

TAMPING MACHINES, CONCRETE BLOCK
Cement Block Machinery Co., Newark, N. J.
Zagelmeyer Cast Stone Block Mchy. Co., Bay City, Mich.

TANKS, AIR COMPRESSOR
*Connery & Co., Inc., Philadelphia
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chicago Bridge & Iron Works, Chicago
Chicago Pneumatic Tool Co., New York
Curtis Pneu. Mchy. Co., St. Louis, Mo.
Graver Corp., East Chicago, Ind.
Heil Co., Milwaukee, Wis.
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Magie Engine & Boiler Works, Erie, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.
Westinghouse Tract. Brake Co., Wilmerding, Pa.
Worthington Pump & Mchy. Co., New York

TANKS, STEEL
*Columbian St. Tank Co., Kansas City, Mo.
*Connery & Co., Philadelphia
*Joseph Hoeberst Co., Cincinnati, Ohio
Bausman Mfg. Co., Millersville, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Machine Co., Racine, Wis.
W. E. Caldwell Co., Louisville, Ky.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Dover Boiler Works, New York
Edwards Mfg. Co., Cincinnati, O.
Farrell Mfg. Co., Joliet, Ill.
C. C. Fouts Co., Middletown, Ohio
Graver Corp., E. Chicago, Ind.
R. Hardesty Mfg. Co., Denver, Colo.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heil Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Magie Eng. & Boiler Works, Erie, Pa.
New York Central Iron Works Co., Hagerstown, Md.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh
United Iron Works, Inc., Kansas City, Mo.

TANKS, WOOD
W. E. Caldwell Co., Louisville, Ky.
G. M. Davis & Son, Palatka, Fla.
Eagle Tank Co., Chicago
Hauser-Stander Tank Co., Cincinnati, Ohio
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
National Tank & Pipe Co., Portland, Ore.
Pacific Tank & Pipe Co., San Francisco
Redwood Mfrs. Co., San Francisco
A. T. Stearns Lumber Co., Boston
U. S. Wind Eng. & Pump Co., Batavia, Ill.
Wendnagel & Co., Chicago

TAPES, STEEL AND METALLIC
Eugene Dietzgen Co., New York
Keuffel & Esser Co., Hoboken, N. J.
Lufkin Rule Co., Saginaw, Mich.
The L. S. Starrett Co., Athol, Mass.

TAR
*Barrett Co., New York
American Tar Products Co., Pittsburgh, Pa.

TAR KETTLES (See Kettles)

THAWING OUTFITS
*Chausse Oil Burner Co., Elkhart, Ind.
Ascroll Burner Co., West New York, N. J.
Littleford Bros., Cincinnati
Hauck Mfg. Co., Brooklyn, N. Y.

TIES, STEEL
Carnegie Steel Co., Pittsburgh, Pa.
International Steel Tie Co., Cleveland, O.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TIRES, RUBBER (For Motor Trucks)
Firestone Tire & Rubber Co., Akron, O.
Fisk Tire Co., Chicopee Falls, Mass.
Goodrich Rubber Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelly Springfield Tire Co., New York
U. S. Tire Co., New York

TOOL HOUSES, PORTABLE STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
Littleford Bros., Cincinnati, Ohio

TORCHES, OIL HEATING
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
Hauck Mfg. Co., Brooklyn, N. Y.
Hoosier Paint Works, Ft. Wayne, Ind.
Littleford Bros., Cincinnati
Mead-Morrison Mfg. Co., East Boston, Mass.
Alex Milburn Co., Baltimore, Md.
Sewall Paint & Varnish Co., Kansas City, Mo.
Sherwin-Williams Co., Cleveland, O.
Tropical Paint & Oil Co., Cleveland, O.
Truscon Laboratories, Detroit, Mich.

TORCHES, WARNING
*Toledo Pressed Steel Co., Toledo, Ohio
McCloskey Torch Co., Toledo, Ohio

TOWERS (See Standpipes and Elevated Tanks)

TRACKS, INDUSTRIAL AND PORTABLE
*Lakewood Eng. Co., Cleveland, O.
Atlas Car & Mfg. Co., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Foundry & Mfg. Co., Columbus, O.
Easton Car & Construction Co., Easton, Pa.
C. W. Hunt Co., Inc., W. N. Brighton, N. Y.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TRACTION TREADS (See Treads, Traction)

TRACTORS
*Allis-Chalmers Mfg. Co., Milwaukee
*Atlas Engineering Co., Clintonville, Wis.
*Caterpillar Tractor Co., San Leandro, Calif.
*Cleveland Tractor Co., Cleveland, O.
*Huber Mfg. Co., Marion, O.
*International Harvester Co., Chicago
*John Lauson Co., New Holstein, Wis.
*Rogers Bros. Corp., Albion, Pa.
*United Tractors & Equipment Corp., Chicago
Advance-Rumely Thresher Co., Laporte, Ind.
Bates Mfg. Co., Joliet, Ill.
J. I. Case Threshing Machine Co., Racine, Wis.
Electric Wheel Co., Quincy, Ill.
Emerson-Brantingham, Rockford, Ill.
Hart-Parr Co., Charles City, Ia.
Lombard Tractor & Truck Corporation, N. Y.
Mack Trucks, Inc., New York
Mead-Morrison Mfg. Co., E. Boston
Minneapolis Steel & Mach. Co., Minneapolis
W. A. Riddell Co., Bucyrus, Ohio
Shaw-Enochs Tractor Co., Minneapolis
Wehr Co., Milwaukee

TRACTOR HITCHES
*Gustav Schaefer Co., Cleveland
Trail-IT Co., St. Paul, Minn.
Whitehead & Kales Co., Detroit

TRAFFIC LINE MARKING MACHINES
Carrara Paint Co., Cleveland, O.
Continental Prod. Co., Euclid, O.
Line-O-Graph Co., N. Y.
Littleford Bros., Cincinnati, Ohio
Newaygo Engr. Co., Newaygo, Mich.

TRAFFIC PAINT
J. E. Bauer Co., Los Angeles, Cal.
Continental Prod. Co., Euclid, O.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Hoosier Paint Wks., Ft. Wayne, Ind.
Hanline Bros., Baltimore, Md.
Tropical Paint & Oil Co., Cleveland, O.

TRAFFIC PLATES
Alan Wood Iron & Steel Co., Philadelphia
American Pressed Steel Co., Philadelphia
Central Iron & Steel Co., Harrisburg, Pa.

TRAFFIC SIGNAL EQUIPMENT
*Toledo Pressed Steel Co., Toledo, Ohio
Acme Traffic Signal Co., Chicago
Alumoyd Sign & Signal Co., Chicago
Amer. Gas Accumulator Co., Elizabeth, N. J.
Auto Sign Display Co. of Me., St. Louis, Mo.
Cretney Traffic Guide Co., Madison, Wis.
Crouse-Hinds Co., Syracuse, N. Y.
Eagle Signal Sales Corp., Moline, Ill.
Esseo Mfg. Co., Peoria, Ill.
Everny-Century Sign Co., Boston
Griswold Safety Signal Co., Minneapolis
Horni Signal Mfg. Corporation, Newark, N. J.
Line Material Co., South Milwaukee, Wis.
Little Giant Co., Mankato, Minn.
Lyle-Signs, Minneapolis, Minn.
Rochester Street Signal Co., Rochester, N. Y.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
Traffic Equipment Corp., N. Y.
Union Iron Prod. Co., E. Chicago, Ind.
Welsbach Traffic Signal Co., Philadelphia

TRAILERS FOR TRUCKS AND TRACTORS
*Electric Wheel Co., Quincy, Ill.
*Euclid Crane & Hoist Co., Euclid, O.
*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Arcadia Trailer Corporation, Newark, N. J.
Detroit Trailer & Mach. Co., Detroit
Eagle Wagon Works, Auburn, N. Y.
Easton Car & Construction Co., Easton, Pa.
Fruehauf Trailer Co., Detroit, Mich.
Hercules Trailer Mfg. Co., Los Angeles
Imperial Mach. Co., Minneapolis
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Chicago
Little Red Wagon Mfg. Co., Omaha
Miami Trailer-Scraper Co., Troy, O.
Muskogee Iron Wks., Muskogee, Okla.
Smith Trailer Corp., Syracuse, N. Y.
Trailmobile Co., Cincinnati
Troy Trailer & Wagon Co., Troy, O.
Warner Mfg. Co., Beloit, Wis.
Whitehead & Kales Co., Detroit

TRAILERS, HEAVY MACHINERY
*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.

TRAILERS, INDUSTRIAL
*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
*Lakewood Eng. Co., Cleveland, O.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Chase Fdry. & Mfg. Co., Columbus, O.
Clark Tractractor Co., Battle Creek, Mich.
Detroit Trailer & Machinery Co., Detroit
Easton Car & Construction Co., Easton, Pa.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Plymouth, Ind.
Miami Trailer-Scraper Co., Troy, O.
Trailmobile Co., Cincinnati
Whitehead & Kales Co., Detroit

TRAILER COUPLINGS
*Gustav Schaefer Co., Cleveland
Trail-IT Co., St. Paul, Minn.

TRAMWAYS, AERIAL WIRE ROPE (See Aerial Wire Rope Tramways)

TRANSFORMERS
*Allis-Chalmers Mfg. Co., Milwaukee
Duncan Elec. Mfg. Co., Lafayette, Ind.
Enterprise Elec. Co., Warren, O.
General Elec. Co., Schenectady, N. Y.
Kuhlman Elec. Co., Bay City, Mich.
Maloney Electric Co., St. Louis, Mo.
Packard Electric Co., Warren, O.
Pittsburgh Trans. Co., Pittsburgh, Pa.
Wagner Elec. Corp., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TRANSITS AND LEVELS (See Instruments)

TRANSMISSION MACHINERY, POWER
*Allis-Chalmers Mfg. Co., Milwaukee
Chain Belt Co., Milwaukee
Dodge Mfg. Corpn., Mishawaka, Ind.
Kent Machine Co., Kent, O.
Link-Belt Co., Chicago
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

Real Cost Saving

Placing Concrete

Underground or above, a Haiss Conveyor pays a profit

"Saves wheeling"

A HAISS Belt Conveyor can speed your concrete construction work—saving money all along the line. You can cut out the slow motion wheeling of buggy loads, the building of platforms, ramps and walk-ways. A Haiss conveyor can be set at a low angle for the footing course, and at an increasingly steeper angle as the work progresses. The whole plan is so simple, and the savings so evident, that you will want to look into it for your next job. *Write for Catalog 1127.* George Haiss Manufacturing Co., Inc., 142nd Street and Park Ave., New York, N. Y.

"Saves shoveling"

HAISS Portable Belt CONVEYORS

H-441

Where to Purchase

TRASH CANS (See Cans)

TREADS, SAFETY
*Blaw-Knox Company, Pittsburgh, Pa.
American Abrasive Metals Co., N. Y.
American Mason Safety Tread Co., Lowell, Mass.
Concrete Steel Co., N. Y.
Norton Co., Worcester, Mass.

TREADS, TRACTION
*Caterpillar Tractor Co., San Leandro, Cal.
*Trackson Co., Milwaukee
Belle City Mfg. Co., Racine, Wis.
Creeper Wheel Co., Reading, Pa.
Electric Wheel Co., Quincy, Ill.
Tractor Grip Wheel Co., Toledo, O.
Whitehead & Kales Co., Detroit

TRENCH EXCAVATORS (See Excavators)

TRENCH PUMPS (See Pumps, Contractors')

TRUCKS, TANK & SPRINKLER (See Wagons, Tank & Sprinkler)

TURBINES
Allis-Chalmers Mfg. Co., Milwaukee
De Laval Steam Turbine Co., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., N. Y.
Terry Steam Turbine Co., Hartford, Conn.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

TURNTABLES FOR MOTOR TRUCKS
*Blaw-Knox Co., Pittsburgh, Pa.
Champion Engine Co., Keaton, O.
Easton Car & Construction Co., Easton, Pa.
Freeman Mfg. Co., Racine, Wis.
Hug Co., Highland, Ill.
Western Structural Co., Moline, Ill.

VALVES, CHECK
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston
Ludlow Valve Mfg. Co., Troy, N. Y.
Mich. Valve & Foundry Co., Detroit
Rensselaer Valve Co., Troy, N. Y.

VALVES, GATE AND INDICATOR POSTS
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston
Columbian Iron Works, Chattanooga, Tenn.
Crane Company, Chicago
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Michigan Valve & Fdry. Co., Detroit
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Waterous Co., St. Paul
R. D. Wood & Co., Philadelphia

VALVES FOR GASOLINE ENGINES
*Industrial Engine Parts Co., Inc., Cleveland

VALVES, RELIEF
*Neptune Meter Co., New York

VALVES, TAPPING
Eddy Valve Co., Waterford, N. Y.
Hays Mfg. Co., Erie, Pa.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Co., Troy, N. Y.
Michigan Valve & Foundry Co., Detroit
Rensselaer Valve Co., Troy, N. Y.
Waterous Co., St. Paul
A. P. Smith Mfg. Co., E. Orange, N. J.

VALVE BOXES AND HOUSINGS
*Central Foundry Co., N. Y.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
Columbian Iron Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Mueller Co., Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Waterous Co., St. Paul
R. D. Wood & Co., Philadelphia

VOTING EQUIPMENT FOR CITIES
Automatic Registering Machine Co., Jamestown, N. Y.
Ideal Voting Booth Co., Sullivan, Ind.
Douglas Manufacturing Co., Crete, Nebr.
Pennsylvania Construction Co., Marietta, Pa.
Korff Manufacturing Co., Lansing, Mich.
Van Dorn Iron Works Co., Cleveland, O.

WAGONS (See Dump Carts and Wagons)

WAGON BODIES (See Dump Bodies)

WAGON LOADERS (See Loaders, Gravel)

WAGONS & TRUCKS, TANK & SPRINKLER
*Joseph Henhorst Co., Cincinnati, O.
Acme Road Machinery Co., Frankfort, N. Y.
Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Machine Co., Racine
Galion Iron Works & Mfg. Co., Galion, Ohio
Heil Co., Milwaukee, Wis.
Mack Trucks, Inc., New York

WALL TIES
Berger Mfg. Co., Canton, O.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Wheeling, W. Va.
Hawley Mfg. Co., Chicago
M. & M. Wire Clamp Co., Minneapolis
Milwaukee Corr. Co., Milwaukee, Wis.
Niagara Metal Stamp Corp., Niagara Falls, N. Y.
Wedgit Tie Co., Inc., New York

WASHERS, SAND AND GRAVEL
*Allis-Chalmers Mfg. Co., Milwaukee
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Smith Engineering Works, Milwaukee
Stephens-Adamson Mfg. Co., Aurora, Ill.

WATCHES, STOP
Sterling Stop Watch Co., New York

WATER MAIN TAPPING MACHINES
Glauber Brass Mfg. Co., Cleveland
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
A. P. Smith Mfg. Co., E. Orange, N. J.

WATER METERS (See Meters, Water)

WATERPROOFING COMPOUNDS AND MATERIALS
*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Company, N. Y.
*Philip Carey Co., Cincinnati, O.
*Standard Oil Co. (Indiana), Chicago
Anti-Hydro Waterproofing Co., Newark, N. J.
Atlantic Refining & Asphalt Corp., Philadelphia
Euclid Chemical Co., Cleveland
Genfire Steel Co., Youngstown, O.
Master Builders Co., Cleveland, O.
Minwax Co., N. Y.
Ruberoid Co., N. Y.
Sandusky Cement Co., Cleveland, O.
Sonneborn Sons, Inc., N. Y.
Texas Company, N. Y.
Tech Brothers, N. Y.
Truscon Laboratories, Detroit, Mich.

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*Wallace & Tiernan Co., Inc., Newark, N. J.
Cochrane Corp., Philadelphia
Paraden Mfg. Co., Arlington, N. J.
R. U. V. Co., N. Y.

WATER PURIFICATION CHEMICALS
Arnold Hoffman & Co., Inc., N. Y.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Electro Bleaching Gas Co., N. Y.
General Chemical Co., N. Y.
Hooker Electrochemical Co., N. Y.
Mathieson Alkali Works, Inc., N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia

WATER SOFTENERS
American Water Softener Co., Philadelphia
Cochrane Corp., Philadelphia
Graver Corp., E. Chicago, Ind.
International Filter Co., Chicago
Permutit Co., N. Y.
W. B. Scaife & Sons, Pittsburgh, Pa.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

WATER WASTE DETECTION
Empire Electric & Water Co., Inc., N. Y.
Pitometer Co., N. Y.
Simplex Valve & Meter Co., Philadelphia

WATER WHEELS
*Allis-Chalmers Mfg. Co., Milwaukee
J. Leffel & Co., Springfield, O.
I. P. Morris and De La Vergne, Inc., Hydr. Div., Philadelphia
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.
Pelton Water Wheel Co., San Francisco
S. Morgan Smith Co., York, Pa.
Worthington Pump & Machinery Corp., N. Y.

WATER WORKS PUMPS (See Pumps)

WEIGHING MACHINES
*Conveying Weigher Co., N. Y.

WELDING APPARATUS
*Alex. Milburn Co., Baltimore, Md.
*Oxweld Acetylene Co., L. I. City, N. Y.
Burke Electric Co., Erie, Pa.
Fusion Welding Corp., Chicago
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland, O.
Macleod Co., Cincinnati, O.
Smith's Inventions, Inc., Minneapolis, Minn.
U. S. Light & Heat Corp., Niagara Falls
Westinghouse Electric & Mfg. Co., E. Pittsburg, Pa.
N. J.

WELLS, CONCRETE
Wilson Welder & Metals Co., Inc., Hoboken, N. J.
Kelly Well Co., Grand Island, Neb.

WELLS, GRAVEL WALL
Layne & Bowler, Inc., Memphis, Tenn.

WELL-DRILLING AND BLAST HOLE MACHINES
*The Buch Corp., Crestline, Ohio
*Loomis Machine Co., Tiffin, O.
*Sanderson Cyclone Drill Co., Orrville, O.
Armstrong Mfg. Co., Waterloo, Ia.
Burkhardt Co., Kiel, Wis.
Keystone Driller Co., Beaver Falls, Pa.
Star Drilling Machine Co., Akron, O.

WELL SCREENS
A. D. Cook, Inc., Lawrenceburg, Ind.
E. E. Johnson, Inc., St. Paul, Minn.

WHEELBARROWS
*General Wheelbarrow Co., Cleveland, O.
*Lansing Co., Lansing, Mich.
Asheboro Wheelbarrow Co., Asheboro, No. Carolina
American Steel Scraper Co., Sidney, Ohio
Case Crane & Engg. Co., Columbus, Ohio
Chattanooga Wheelbarrow Co., Chattanooga, Tenn.
Cleveland Wheelbarrow Co., Cleveland, O.
Fairbanks Co., N. Y.
Jackson Mfg. Co., Harrisburg, Pa.
Puffer-Hubbard Mfg. Co., Minneapolis
Sidney Steel Scraper Co., Sidney, O.
Sterling Wheelbarrow Co., Milwaukee
Toledo Wheelbarrow Co., Toledo, O.

WHEELS FOR ALL USES
*Electric Wheel Co., Quincy, Ill.

WHEELS, CRAWLER TYPE FOR WAGONS
*Creeper Wheel Co., Reading, Pa.

WINCHES
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, O.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Dobbie Foundry & Mach. Co., Niagara Falls
*Mundy Sales Corp., N. Y.
*Gustav Schaefer Co., Cleveland
Advance-Rumely Thresher Co., La Porte, Ind.
Bethlehem Steel Co., Bethlehem, Pa.
Chisholm-Moore Mfg. Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Ersted Mfg. Co., Portland, Ore.
John T. Horton Co., New York
Ingersoll-Rand Co., New York
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., E. Boston
Muskogee Iron Wks., Muskogee, Okla.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Street Bros. Mach. Works, Chattanooga

WINDOW FRAMES AND SASH (Metallic)
*Truscon Steel Co., Youngstown, O.
Wm. Bayley Co., Springfield, O.
Detroit Steel Prod. Co., Detroit
E. D. Frederick Co., Holyoke, Mass.
Genfire Steel Co., Youngstown, O.
David Lupton's Sons Co., Philadelphia
Penn Metal Co., Boston
Sykes Co., Chicago

WIRE AND CABLE
*American Steel & Wire Co., Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
American Cable Co., N. Y.
Copperweld Steel Co., Glassport, Pa.
Fischer & Hayes Rope & Steel Co., Chicago
General Electric Co., Schenectady, N. Y.
Habirshaw Cable & Wire Corp., N. Y.
Hazard Wire Rope Co., Wilkesbarre, Pa.
Mac Whyte Co., Kenosha, Wis.
Marion Insulated Wire & Rubber Co., Chicago
National India Rubber Co., Bristol, R. I.
New York Insulated Wire Co., N. Y.
Okonite Co., Passaic, N. J.
John A. Roebling's Sons Co., Trenton, N. J.
Safety Cable Co., N. Y.
Simplex Wire & Cable Co., Boston
Standard Underground Cable Co., Pittsburgh, Pa.
Tubular Woven Fabric Co., Pawtucket, R. I.

WIRE MESH REINFORCEMENT
*American Steel & Wire Co., Chicago
*Truscon Steel Co., Youngstown, O.
National Steel Fabric Co., Pittsburgh, Pa.
Wickwire-Spencer Steel Co., N. Y.

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*L. P. Green, Chicago
John A. Roebling's Son Co., Trenton, N. J.

WIRE ROPE (See Rope, Wire)

WOODWORKING MACHINES
*American Saw Mill Machinery Co., Hackettstown, N. J.
*C. H. & E. Mfg. Co., Milwaukee, Wis.
R. L. Carter Co., Phoenix, N. Y.
Jaeger Portable Power Corp., Detroit
Jones Superior Machine Co., Chicago
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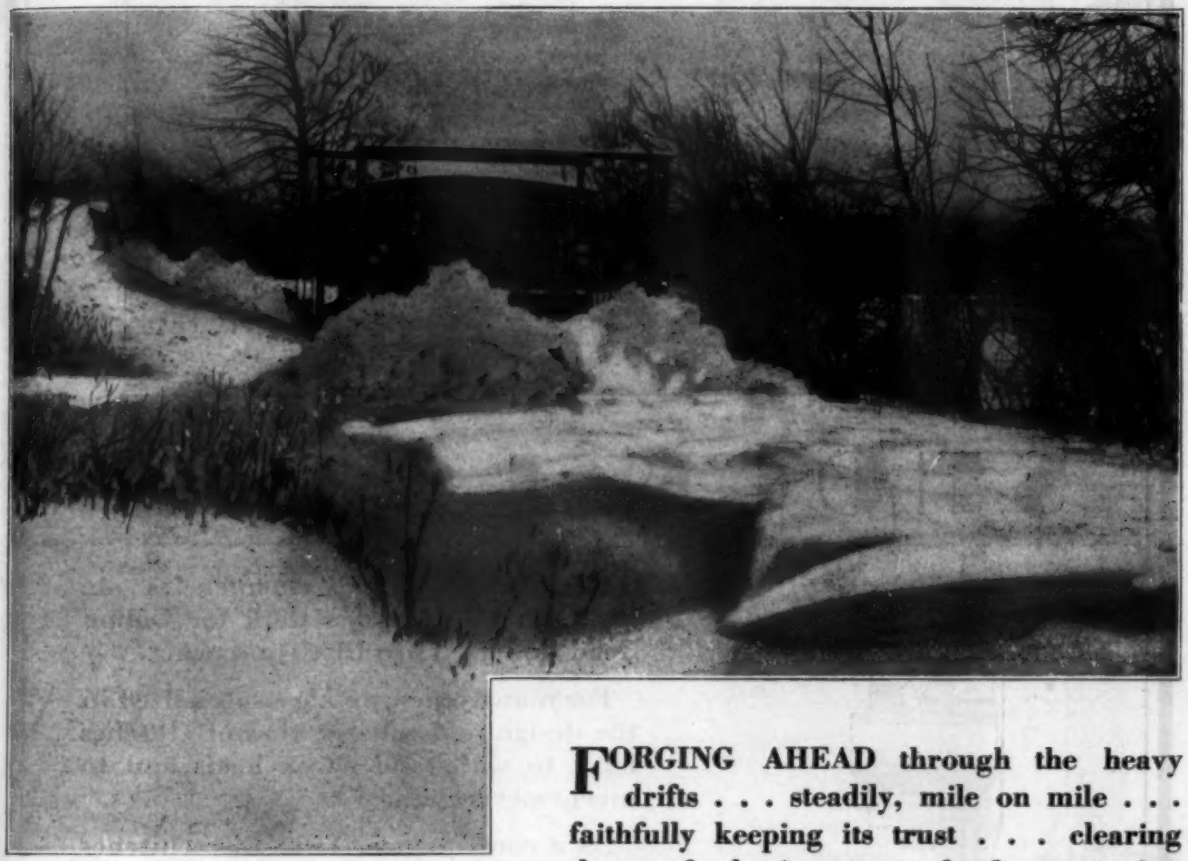
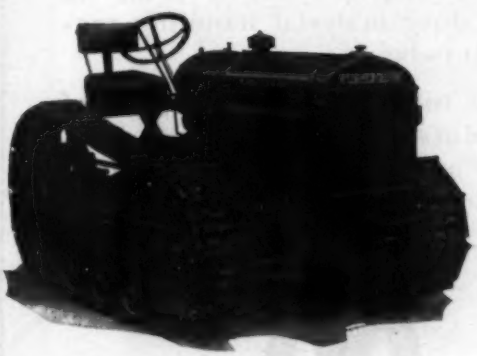
Whipping the Blizzards





Model LH
Trackson-McCormick-Deering

FORGING AHEAD through the heavy drifts . . . steadily, mile on mile . . . faithfully keeping its trust . . . clearing the way for business . . . for fire protection . . . for the doctor's urgent call. ¶ Not just the highways—*every* road in your community must be kept open. And no equipment will do it more thoroughly, more quickly or more economically than a good snow plow driven by the sure-footed crawlers of a Trackson-McCormick-Deering. When winter is over this sturdy power unit is easily detached from the plow and used with one-man graders, scrapers, etc., thus providing year-round usefulness. Write for full details.

Trackson Company

FULL-CRAWLERS & TRACTOR EQUIPMENT

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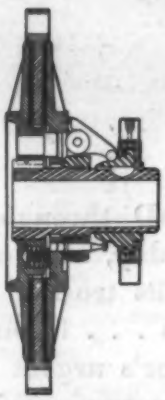
FULL-CRAWLERS ★ BULLDOZERS ★ LOADERS ★ SHOVELS ★ CRANES

Please mention the CONTRACTORS AND ENGINEERS MONTHLY—it helps.

SHOCK LOADS



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Boston, Mass.—Rapp-Huckins Co. Inc., 59 Haverhill St.
Buffalo, N. Y.—Edward W. Rode, 45 A. St.
Cleveland—Industrial Engine Parts, Inc., 1053 E. 61st St.
Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Ave.
Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Ave.
Detroit—Whitney Brothers, 6464 Epworth Blvd.
Fort Worth, Tex.—Fort Worth Wheel & Rim Co., 312 Throckmorton St.
Houston, Tex.—Portable Rig Co., Inc.
Los Angeles—Coast Machinery Corporation, 406 E. Third St.
New York City—John Reiner & Company, Inc., 309 Church St.
Philadelphia, Pa.—Maerky Machine Works, 240 Cherry St.
Pittsburgh, Pa.—Motive Parts Co. of Pa., 6314 Penn. Ave.
Raleigh N. C.—Motor & Equipment Co., 215 E. Davie St.
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SHOCK loads and emergencies are just part of the day's work for Galion Road Rollers, Twin Disc equipped.

For many years, we have specialized in the design and construction of clutches built to withstand shock loads and to meet emergencies.

As a consequence, Twin Disc clutches are standard equipment in many of the heavy duty material handling machines built today.

We invite interested manufacturers of such machines, as well as old customers, to pay us a visit at the coming Road Show. There will be some new developments for you to see and discuss.

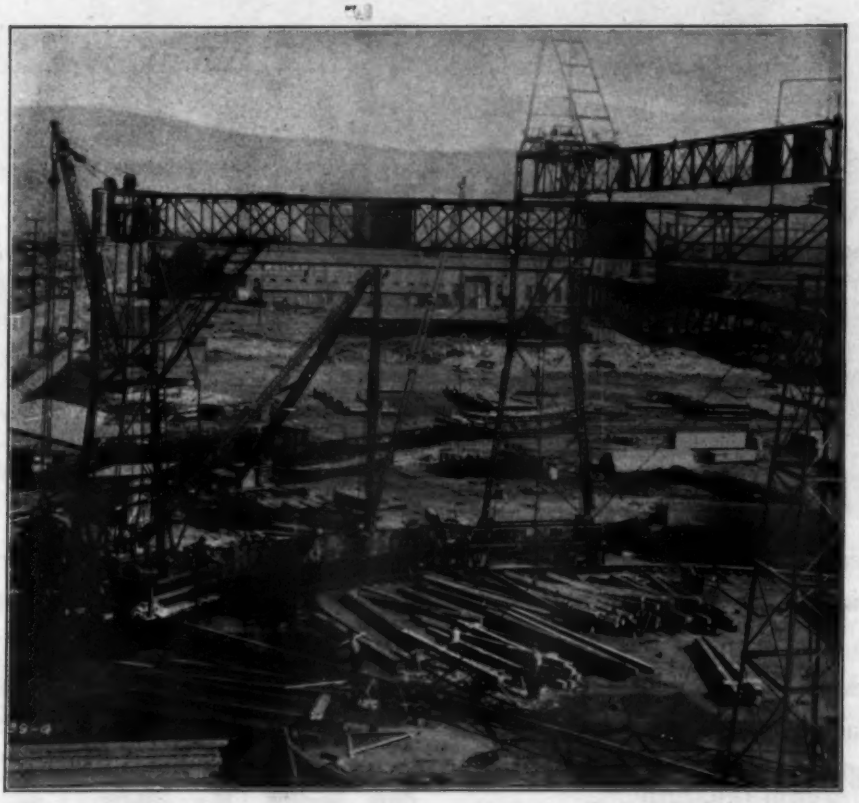
TWIN DISC CLUTCHES

TWIN DISC CLUTCH COMPANY
RACINE WISCONSIN

CLYDE HOISTS-DERRICKS

used by thousands

For all kinds of work - all over the world - there are thousands of Clyde hoists being used by satisfied owners. Built for performance and service, they justify the highest expectations of the most critical operator. Below is shown a gas tank being built at Duluth, by the Stacey Mfg. Co. Three Clyde hoists are working on this job - a two drum gas hoist operates the derrick in the background - a two drum steam operates the traveling crane - and a two drum electric operates the riveter.



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CLYDE TWO MARKS OF GUARANTEED QUALITY SUCCESSFUL PERFORMANCE COUPLED WITH ECONOMY

Saving men, money, minutes

These "Caterpillars" are grading and leveling for a huge industrial plant—a plant that had to be built in a hurry. Because this contracting firm* was armed with "Caterpillar" Tractors and modern equipment, it was awarded the job *at a premium.* Although working in the roughest places and ignoring bad weather the job progressed faster than the engineers could lay out the foundations! Extra power and traction mean extra profits!

*McCrady Brothers, Pittsburgh, Pennsylvania.

Prices—f. o. b. Peoria, Illinois

TEN	$1125	TWENTY	$1975
FIFTEEN	$1500	THIRTY	$2475
SIXTY	$4300		

Caterpillar Tractor Co.

PEORIA, ILLINOIS *and* SAN LEANDRO, CALIF., U. S. A.

Track-type Tractors / Combines / Road Machinery

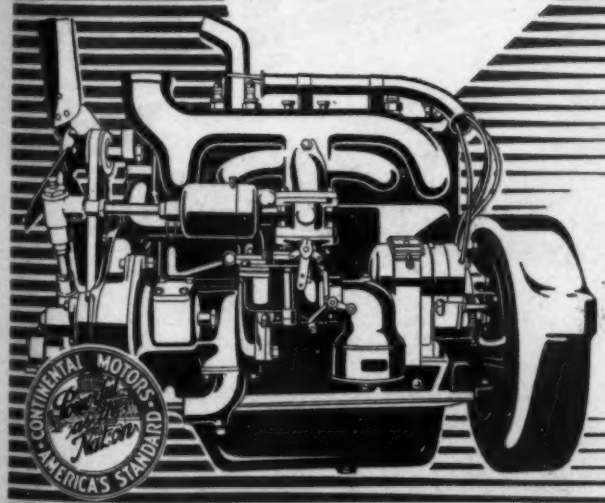
(There is a "Caterpillar" Dealer Near You)

CATERPILLAR
REG. U.S. PAT. OFF.
TRACTOR

PROMPT AS THE LIMITED

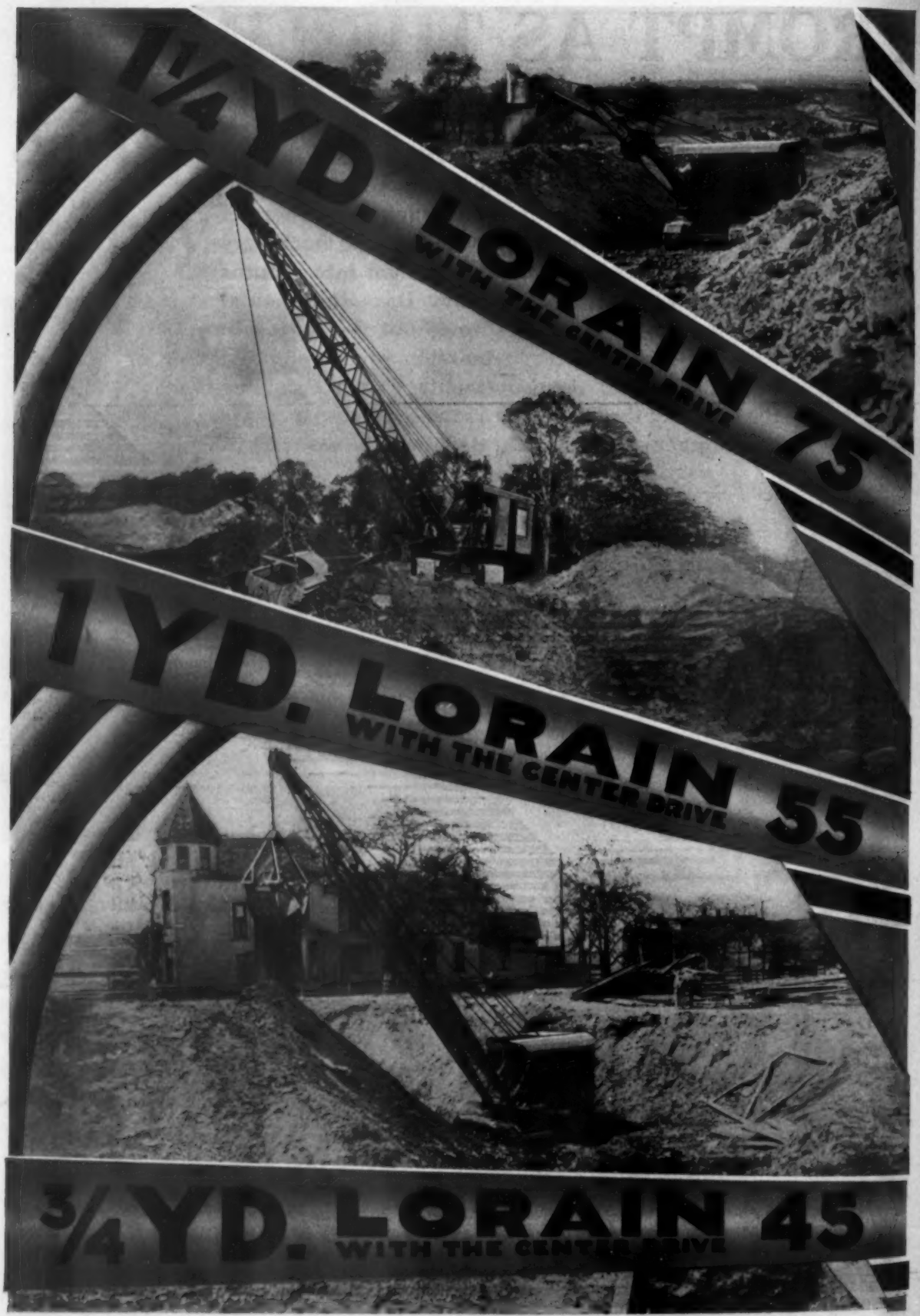
Finished on time—is the proud boast of contractors and railway engineers alike. With both groups of men, the watch, calendar and time sheet are symbols of the exact schedule on which they operate. The vital factor in these schedules is machinery that works steadily as hours lengthen into months and years. That is why Heavy Duty Continental Engines are so popular throughout the nation in road construction, large building operations and in the oil fields. For Continental Engines shorten the length of time devoted to each job and so increase the number of jobs and the profits of the contractor.

CONTINENTAL MOTORS CORPORATION
INDUSTRIAL EQUIPMENT DIVISION
Office and Factory: Muskegon, Michigan
The Largest Exclusive Motor Manufacturer in the World



A roll call of all manufacturers using Continental Heavy Duty Industrial Engines and Units will appear in the next month's issue. This will be of unusual interest. Watch for it!

Continental Engines


1¼ YD. LORAIN 75
WITH THE CENTER DRIVE
1 YD. LORAIN 55
WITH THE CENTER DRIVE
¾ YD. LORAIN 45
WITH THE CENTER DRIVE

TODAY
the 3/4 yd.
LORAIN
45
famous Center
Drive applied to
truck and shovel boom, and
backed by Thew's reputation
and 34 years experience.
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Cranes · Draglines · Backdiggers · Locomotive Cranes
THEW
CENTER
DRIVE
1930
CONVENTION
ROAD SHOW
A.R.E.A.
ATLANTIC
CITY, N. J.
JAN.
13-18

Note the Strength and Power and the Modern Design in the Heavy-Duty Internationals. They range up to 5-ton. All have 5 forward and 2 reverse speeds.

King of the Highway
— *the International Truck!*

Companion to the King
—the McCormick-Deering Industrial Tractor

This sturdy tractor has earned its place as the standard of compact, flexible, many-sided mobile power. General contractors, road and street builders, plant and yard operators, coal and building material handlers, mines, railroads, docks, and the like, use thousands of McCormick-Deerings. They push, pull, haul, and hoist, combining with an endless variety of operating equipment. Ask for a demonstration. Write for the booklet *"Tractor Power in Industry."*

IN this great automotive age the success of International Trucks stands like a beacon on the horizon. Coming into prominence like a thoroughbred destined for victory, International Harvester has scored a triumph in truck engineering and in popular approval throughout the world. The basic reason is twofold: International trucks are soundly built on twenty five years' experience in automotive manufacture—and International performance is safeguarded by a Company-owned truck service organization without a peer in the industry.

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International Trucks include the ¾-ton Special Delivery; the 1-ton Six-Speed Special; Speed Trucks, 1¼, 1½, and 2-ton; and Heavy-Duty Trucks to 5-ton. Company-owned branches at 174 points and dealers everywhere have the line on their display floors for convenient inspection. Catalogs on request.

INTERNATIONAL HARVESTER COMPANY
of AMERICA
(Incorporated)
606 So. Michigan Ave. Chicago, Illinois

Universal Truck Crane unloading grain ship from Argentina, lifting 50 ft. plus bales at the 6 10-CRANE Pennsylvania Warehouse, Jersey City.

A quick and economical way to load sand, gravel, dirt, coal, scrap, etc.

Aggregate for 2000 cu. yds. of concrete was loaded into this silo by the Schaduell Crane Service Company's Universal Truck Crane.

Steel for this type of building is easily erected with these two Universal cranes. Only 1400 tons were set in 25 crane days.

1930 CONVENTION ROAD SHOW A.R.B.A. ATLANTIC CITY, N.J. JAN. 13-18

1929 JOBS
DONE ON TIME

RIGHT NOW when you want to keep your big equipment going steadily, to complete this year's contracts on time, a Universal Truck Crane can save you a lot of expense and worry.

Here is a machine that can travel at motor truck speed, taking care of the cleanup work, from one end of the job to the other.

You can use it to unload a car of supplies, for road ditching and berming, or bridge building. You can send it to pull up forms, remove a slide or slip, dig footings, or for any of the hundred and one short jobs that ordinarily slow things up.

If you haven't enough work to warrant the purchase of a machine now, you can rent a Universal Crane from your local crane service company, to tide you over until spring.

THE UNIVERSAL CRANE COMPANY
Lorain, Ohio

UNIVERSAL

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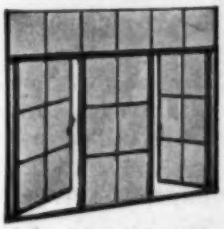

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40	7140	2500
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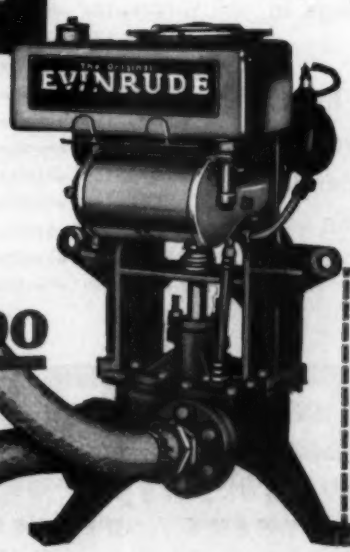
55	3360	2700



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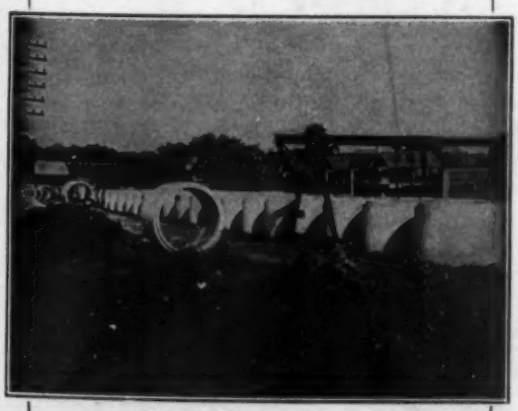

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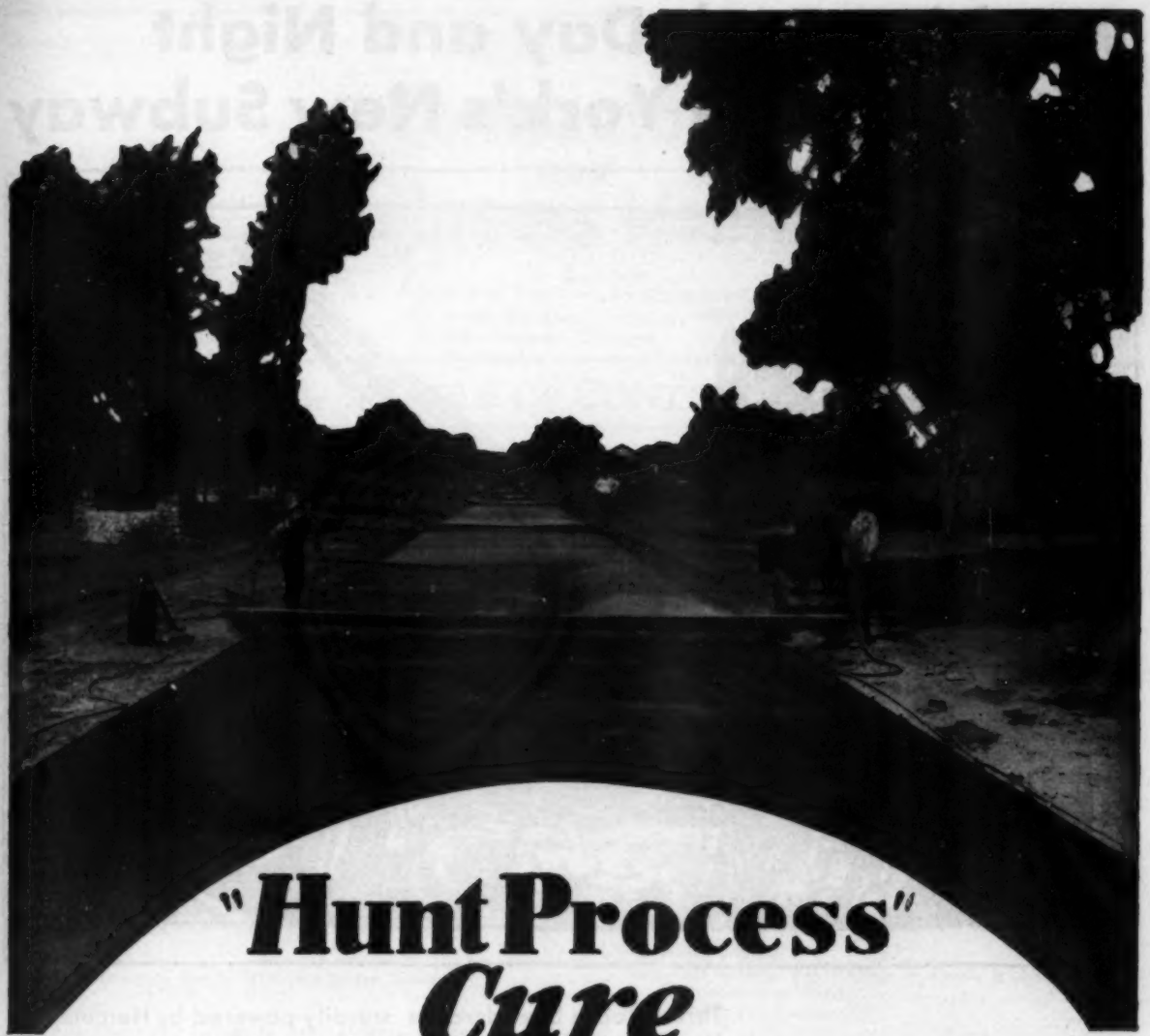

"Hunt Process" *Cure* for this South Bend Ind. Job

ABOVE is shown a "*Hunt Process*" application on Cleveland Road, a county highway in South Bend, St. Joseph County, Indiana. This road crosses a flat country with fields on either side where a dirt and water cure would be comparatively simple. Yet the contractors preferred "*Hunt Process*" because of its many points of superiority.

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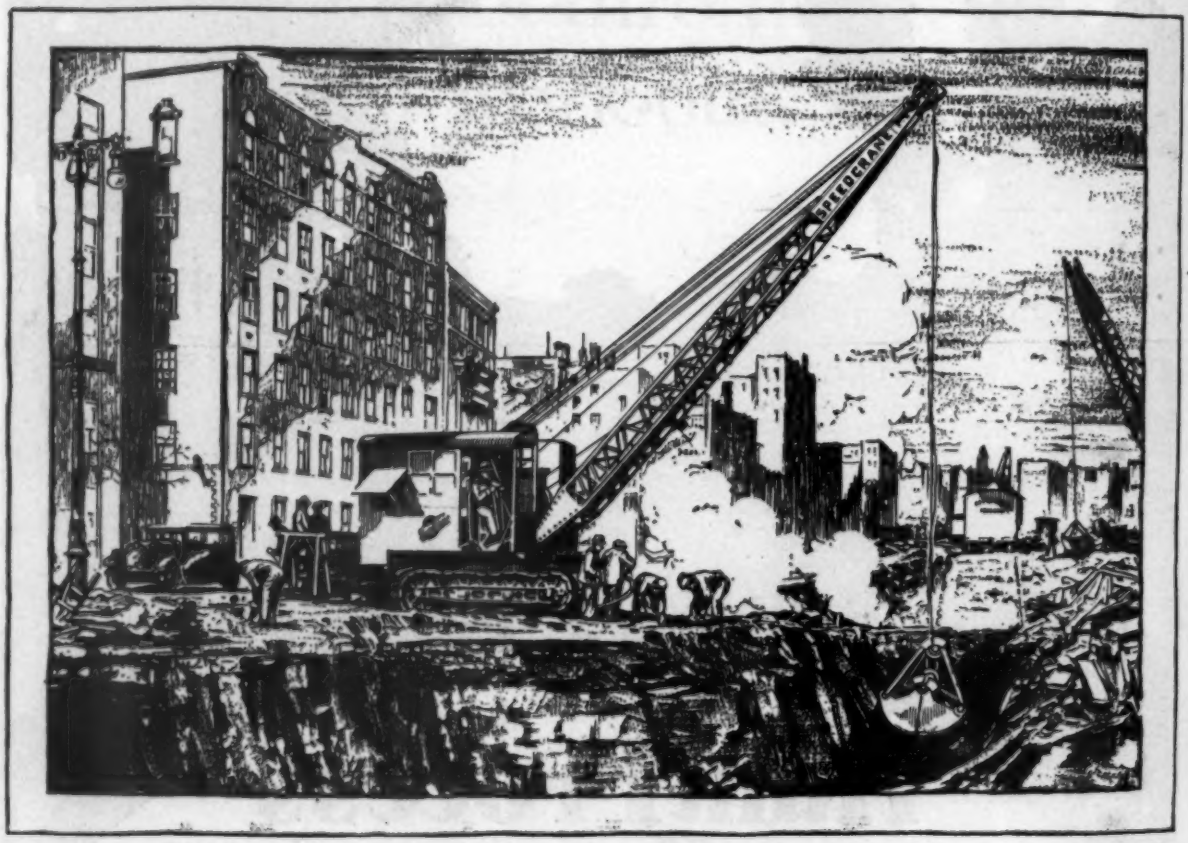

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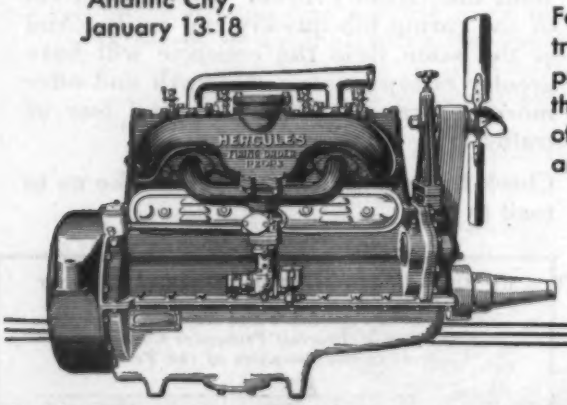

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Please mention the CONTRACTORS AND ENGINEERS MONTHLY—it helps.

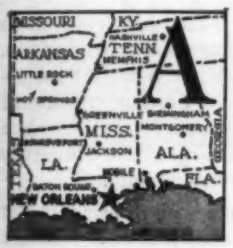
Vol. XIX
No. 5

Contractors and Engineers Monthly

November,
1929

Can Makers Can Build With Speed

Truck Cranes Play Large Part in Excavation and Material Handling In Addition to American Can Company Plant in New Orleans, La.



ADDITIONAL manufacturing space was necessary for the American Can Company plant in New Orleans where both general line cans and sanitary cans are made. The addition decided upon was 132 x 200 feet, first floor plan, which includes a large light court and a connecting structure to the existing plant. The new section has an 8,000-pound Otis elevator, a 10,000-pound Otis elevator and provision for a future installation of another elevator, as well as an air duct and a pipe shaft. The first floor is designed for a load of 1,500 pounds per square foot with intermediate columns under the first floor as a large amount of tin plate will be stored there.

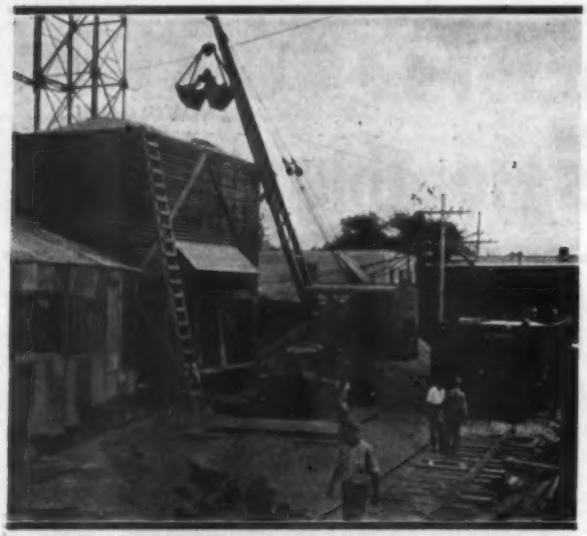
Foundation

Excavation for the foundation was handled by a Universal crane with a ½-yard Owen bucket with an extension lip and teeth. The crane first went up the side of the plot and dug a trench 28 feet wide sufficient for pouring the foundations for two rows of columns along that side. Next 3,400 piling were driven and followed down to within 18 to 24 inches of the cut-off. The earth displaced by concrete and the excess earth was trucked away. As the crane advanced, hand excavation was thrown to where the bucket could reach it, the cutting off of piles followed immediately and this was followed by the pouring of the 14-foot square main footings on 36 piles each and 6-foot x 6-foot 6-inch intermediate footings on 8 piles.

As soon as the crane had completed the excavation for the first double row of columns it went back and started the second double row using the excavated earth for backfill for the first double row. A total of about 4,000 yards of excess earth from the footings was carted away. Each footing had four ¾-inch pins of scrap steel cast into the concrete about 8 inches from the corners to use as dowels to keep pile stubs from being knocked out of place by the machine side casting used to support the first floor forms. This eliminated the need of trusting to mud sills with the chance of settling and warping, due to the soft condition of earth after sidecasting for backfill.

PROGRESS OF FOUNDATIONS FOR ADDITION TO AMERICAN CAN CO. PLANT AT NEW ORLEANS

1. *Photograph taken June 12, 1929, showing first bay completed and crane excavating second bay and casting to the first for fill.*
2. *Progress of work on July 17, 1929, showing several completed bays, concreting plant and twin hoppers for speeding up buggying of concrete to forms*



The Unloading Plant Showing the End of the Spur Track, the Universal Crane, Cribbing Bin and Mixer Below

When work was started it was necessary to remove a 132 x 21-foot galvanized iron shed with a beam and girder 6-inch slab reinforced floor. One of the Universal cranes was used to wreck this floor with a 3,500-pound skull cracker. An oxy-acetylene cutting torch was kept handy to cut the reinforcing as necessary to speed the breaking up of the concrete, which was completely removed in 4 days. A part of this shed was salvaged and used as a cement storage shed during the concreting for the new structure.

Very little space was available for the spur track to spot the cars of aggregate and cement. Only 6 cars could be handled at a time and only two of these could be run beyond the switch to position by the bin. Thus only two cars of material could be spotted at one time and when empty were run out onto the dead end track and two more brought in. One car of cement was brought in at a time and spotted next the cement shed.

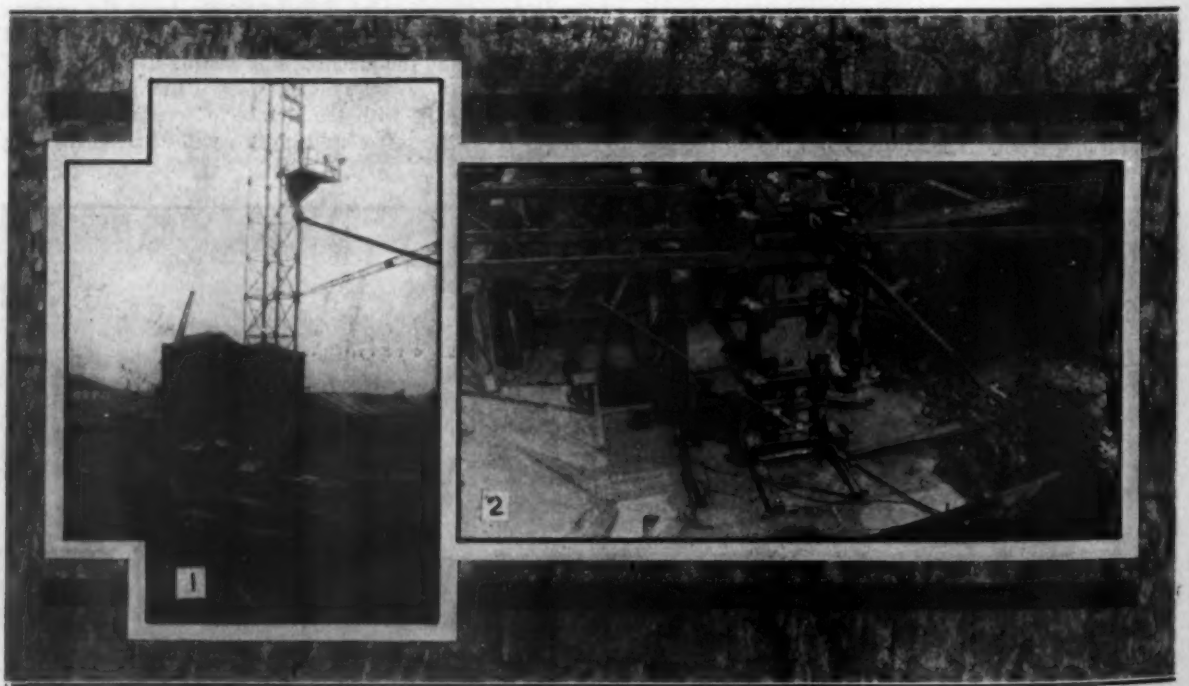
CONCRETING PLANT

The aggregates were clammed out by one of the two Universal cranes rented from Schadwell Crane Service, New Orleans, with the operators. The crane with its ½-yard bucket was able to keep the bins filled and at no time was there any lag in the supply of aggregates to the bins even though the ½-yard outfit was serving a 1-yard Jaeger mixer. The Superintendent of Construction for the American Can Co., reported that the crane made two to three trips from the cars to the bin in the time that a standard crawler crane would take to make one trip.

The bins were built up of 2 x 6-inch planks corn-crib style with two Blaw-Knox batchers mounted beneath. The 1-yard mixer slopped a bit when handling the 30-foot batch of mixed concrete so the Superintendent had built in a forked plate about 1 foot by 4 inches which when fixed by the side of the discharge chute completely stopped the slopping with the oversize batch.

The mixer discharged into a 36-foot Insley bucket on the 180-foot Insley tower. Concrete was chuted a maximum of 130 feet with this outfit. Coal chutes were used on some of the near sections and for the farthest sections the concrete was buggied. In order to speed up the delivery of concrete with the buggies the chuting outfit was rigged to discharge into two hoppers with a

(*Continued on page* 54)



METHODS USED IN THE CONSTRUCTION OF THE ADDITION TO THE AMERICAN CAN CO. BUILDING AT NEW ORLEANS

1. The corn-crib bins, Universal crane and Insley tower and chutes. 2. A detail that saved a lot of grief. Pile stubs were used to support the floor forms from the foundation footings

Important Income Tax Ruling on Funds Withheld for Maintenance of Roads

Fund Held in Contractor's Obligation to Maintain Roads Is Not Deductible from Tax

THE Circuit Court of Appeals has held that a taxpayer, engaged in highway construction work under a contract by which maintenance was guaranteed for a stated period, must report gain or loss accruing under such contract without reference to the obligation of maintenance except where expenditures were necessary in the year the contract was completed, as reported in *The United States Daily*. Its view was that reserves set up against the maintenance obligation, therefore, were not allowable deductions for Federal tax purposes because the liability was entirely contingent.

GEORGE VANG AND GEORGE LANZ, RECEIVERS OF THOMAS CRONIN COMPANY

v.

C. G. LEWELLYN, FORMERLY INTERNAL REVENUE COLLECTOR.

Circuit Court of Appeals, Third Circuit.

Nos. 4053, 4054.

On appeal from the District Court, Western District, Pennsylvania.

Before BUFFINGTON and WOOLLEY, Circuit Judges, and THOMSON, District Judge.

Digest of Decision

Where a taxpayer was engaged in highway construction work under a contract by which it was obligated to maintain the road for a stated period after completion, and the taxpayer set up on its books estimated reserves against such maintenance, deductions for such reserves were disallowed because the liability was contingent and accounting methods including such reserves did not reflect the taxpayer's income within the contemplation of law.—Vang et al., Receivers, v. Heiner, Collector. (*C. C. A.* 3)—*IV U. S. Daily* 1887, *Oct.* 8, 1929.

OPINION OF THE COURT

Sept. 27, 1929

WOOLLEY, Circuit Judge.—Thomas Cronin Co., after payments made under protest, brought these suits against collectors of internal revenue in office at different periods to recover corporation-income and excess-profits taxes assessed and collected for the years 1917 to 1922 under provisions of the revenue acts of 1917, 1918 and 1921. The cases were tried to the court without a jury, mainly on facts stipulated. The defendants had judgments, and the plaintiff appealed.

FUND FOR MAINTAINING ROAD DEDUCTED FROM PROFIT

Of the court's many findings of fact the controlling ones will be compressed into the following statement:

The plaintiff company during the tax years in question was engaged in constructing roads for the city of Pittsburgh and the county of Allegheny under contracts calling for payments by installments as work progressed. Generally the construction work was finished within the year it began; sometimes it extended into the next year. Taking one contract as an illustration of what was done under all, when work had been finished and the last installment of the contract price paid, the company offset expenditures against receipts and regarded the difference as profit or loss on that job. As under each contract the company was required, at its own expense, to maintain the road free of all defects arising from materials or construction for a period of five years after completion, it estimated the probable maintenance costs and set aside an estimated reserve to cover them. This is deducted from the profits it had actually made on the contract and, in its original tax returns, reported the difference as taxable net income for the year the work was finished.

The Commissioner, however, disallowed the estimated reserves for maintenance as deductions, holding that the company's liability for maintenance was contingent, not fixed, and therefore not within the law of allowable deductions. Then the company filed amended returns by which it showed that it kept its accounts on the basis of completed contracts, represented that a contract was not completed until the end of the maintenance period, declared its income from the contract received at that time and calculated its tax at the rate then prevailing.

The trouble in these cases arose out of confusion in the use of the term "lawful method of bookkeeping." The taxpayer's method was for its own purposes entirely lawful, but for tax purposes it was not lawful unless it clearly reflected income. What the company did finally, as shown by its amended returns on which it makes its last stand, was to regard a contract as not completed (and therefore its profits and gains not in-

come subject to tax) until the end of the five years' period of maintenance following the full completion of the work and full payment of the contract price when final maintenance costs had become definitely known. It then put this theory of postponed completion of work and postponed taxable income into bookkeeping operation by carrying installments received on account of the contract price as liabilities and construction expenditures as credits, and also maintenance expenditures as credits, until at the end of the maintenance period it adjusted the books and struck a balance which disclosed a profit or a loss.

METHOD OF BOOKKEEPING IS BASIS OF LITIGATION

The practical result of this method of bookkeeping was, at different periods, to reflect a loss when no loss had been incurred, conceal profits when profits had been made or were in the making, and postpone completion of the contract and final determination of profits as taxable income to the end of the maintenance period and postpone payment of taxes on income actually received years earlier when taxes were higher until years when they were lower. Even so, the method of bookkeeping was lawful for tax purposes if it truly reflected income. Did it?

Oddly enough, moneys coming in as partial payments for work done were by this method treated as liabilities or as moneys going out, and moneys going out in the way of expenditures were treated as credits or moneys coming in. As this did not reflect what actually happened, it did not reflect income. While this method of bookkeeping was entirely honest and was plain enough to the plaintiff and capable of readjustment in the future, it did not show profits and losses, that is, income or lack of it, on a given contract until, at the plaintiff's will, such readjustment was made. What actually happened was the receipt of income by payment of the contract price upon the completion of the work, whether within or beyond the year.

PROFIT SHOULD BE FIXED AT COMPLETION OF WORK

We hold that when the construction work was finished and the contract price paid and the road turned over to the city or county, the contract was completed, disclosing definitely gain or loss in the transaction. This was how the company itself first regarded it when it made and set aside estimated reserves to cover costs of maintenance on its many contracts and then claimed them as deductions from income received in the year the transactions came to an end by payment and delivery. The company's engagement to maintain the work in good condition for five years after completion as a pledge of its workmanship was clearly a contingent liability which might or might not cost money—it occurred in only 3 out of every 12.5 jobs—and, accordingly, might or might not reduce the net income from a contract closed by final payment long before. Cost of maintenance, if any, would of course be a subject for reduction from income in the year in which income was received, but such costs, having no effect upon or relation to the final payment of the contract price at the end of the work, would not keep the contract open and postpone payment of the tax on the income received.

Nor does the fact that the company kept its books on the accrual basis help it, for, however looked at, the liability for maintenance was contingent upon the need of maintenance. When books are kept on an accrual basis a liability must be fixed either in terms or by the occurrence of events from which it is determined before it can be deducted. United States v. Anderson and United States v. Yale & Towne Mfg. Co., 269 U. S. 422; United States v. Guinzburg, 278 Fed. 363.

We affirm the judgments in these two cases on the reasoning of the learned trial court as it related to the tax question. But in Vang v. Lewellyn the learned court gave an additional reason for the judgment in that case, to the effect that this personal action against the former collector cannot be maintained, as the suit should have been brought against the United States. Semple & Co. v. Lewellyn, 1 Fed. (2d) 745; Sage v. United States, 250 U. S. 33. This question is moot in view of the court's decision on the other ground and of our affirmance of its decision on that ground.

Can Makers Can Build

(Continued from page 52)

dividing chute, so that the concrete divided equally into the two hoppers. This made it possible for two men to be up for concrete at the same time. With this method it is possible to pour as high as 400 cubic yards of concrete in 8 hours with only 8 men buggying. The use of buggies was resorted to to prevent the men getting onto the rein steel which happened when they were swinging and manipulating the chutes. By spouting to hoppers and buggying to the forms all the heavy work was done on the solid floor forms and runways laid for the purpose.

The first floor columns of this 5-story structure were 22 feet on centers and measured 18 inches x 4 feet. Deslaurie column forms were used on the interior round columns of the building.

PERSONNEL

This 5-story structure, involving the driving of 3,400 piles, excavation of 10,000 yards of gumbo earth, the pouring of 8,000 cubic yards of concrete and the setting of 575 tons of reinforcing steel was started April 1, 1929, and completed ready for occupancy on November 15, 1929. H. H. Tompkins was Superintendent of Construction for the American Can Co., which was its own builder.

Interesting Book on Excavating Equipment

AN interesting and exceptionally well made-up book of 100 pages, setting forth the complete Northwest line of excavating equipment, has recently been brought out by the Northwest Engineering Co., Chicago, Ill. It is a book of facts dedicated to the man who excavates and moves material.

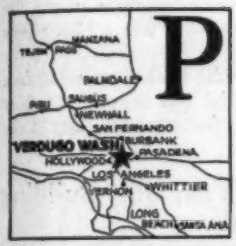
The physical appearance of the book is particularly notable, the cover being of striking design and black. The various kinds of Northwest equipment and illustrated not only by photographs but also by interesting and artistic little black and white sketches and unusual color prints of the machines in action on various jobs throughout the country.

The book is divided into sections, covering shovels, cranes, draglines, pull shovels, skimmer scoops, mechanical specifications, power plants, operating ranges and capacities and a list of owners of Northwest equipment. Each section describes in detail and illustrates its particular subject and is thumb-indexed for easy reference.

Copies of this book may be secured by writing to Northwest Engineering Co., 28 East Jackson Blvd., Chicago, Ill.

Paver and Conveyor Pour Long Concrete Channel

Roche-Axman Co., Glendale, Calif., Assemble Plant Which Moves Along Channel 47½ Feet Wide As It Pours 45 Tons Per Hour



POURING tons of wet concrete per hour using only two pieces of equipment, the Roche-Axman Co., Glendale, Calif., handled the construction of a reinforced concrete lined channel 3,400 feet long, 47½ feet wide with perpendicular side walls 8 feet high in a most interesting manner. By the use of a MultiFoote 27-E paver and a Barber-Greene portable belt conveyor on the Los Angeles County flood control project in Verduga Canyon Wash, Calif., the use of wheelbarrows, cars, chutes and hoists was eliminated.

The conveyor carried the mixed concrete from the paver to the forms and the work was done so rapidly that six men were usually used for tamping. In some places 8 men were employed. The whole mixing and paving unit moved along together as the paver was self-propelled and the conveyor had its wheels swiveled and was fastened to and trailed by the paver.

The floor was first laid with the paver and the reinforcing for the sidewalls placed and the forms set as this work progressed. After the floor was completed the side walls were poured. Six-inch slump concrete was handled direct from the paver into the wall forms by the conveyor equipped with a temporary wooden hopper at the lower end to take the concrete as it was

PLACING CONCRETE WITH A BELT CONVEYOR ON THE VERDUGA WASH PROJECT

1. The MultiFoote paver and Barber-Greene conveyor in the channel. 2. The delivery end of the conveyor showing tampers at work. 3. The conveyor showing the hopper at the left through which concrete flowed from the paver to feed the belt

discharged from the paver drum. The wooden hopper had a discharge slot approximately 6 inches wide. The edges of the slot were covered with pieces of rubber belting which extended down until they touched the belt of the conveyor. The delivery of the concrete from the hopper to the belt was controlled by a round-point, long-handled shovel on the upper end of the discharge slot. The shovel was raised or lowered to increase or decrease the flow to the conveyor.

A small bottomless box, fitting on the wall forms received the wet concrete from the discharge end of the conveyor. Here the 6 or 8 men were located for tamping.

The conveyor was a Barber-Greene plain belt portable unit, 30 feet in length and raised the material 10 feet. The belt was run at standard speed and handled the thin mix very effectively.

Using the combination of a paver and a belt conveyor, the Roche-Axman Co., constructed approximately 75 feet of wall per hour, requiring about 45 tons of material in that length of time. The entire job was completed in 32 working days. Besides handling this concrete on the flood control work, the contractor has also used the same belt conveyor for handling aggregate.

PERSONNEL

The Verduga Canyon Wash project is being carried forward to completion under the direction of E. C. Eaton, Chief Engineer, with S. M. Fisher, as designing engineer.

Concreting Layout for New Denver City Hall

TO place the concrete in the new City Hall being built at Denver, Colo., a mixing plant was set up in the center of the structure ,and a well-planned material handling plant for sand, gravel and cement laid out.

Cement was stored in a small shed close to the plant, while the sand and gravel was carried by a truck up the incline or ramp and dumped into hoppers. These hoppers discharged onto two 60-foot electrically driven all-steel Barber-Greene conveyors into a Blaw-Knox 2-compartment bin. Under the bin are the batchers, equipped with Blaw-Knox inundators. The cement was carried from the shed on a 30-foot all-steel frame electric conveyor to the working platform where the cement was proportioned. Under this bin was a heavy-duty 1-yard Koehring mixer.

Concrete was discharged into a hoist bucket on a 180-foot Insley tower, from which the material was chuted to a floor hopper and carted by hand in 6-cubic-foot concrete carts to the forms.

1928 Shown as Record Year for Building in Canada

A RECORD for new construction was established last year in Canada, according to a trade bulletin recently issued by the Department of Commerce. Building permits issued in 63 principal cities during that period provided for construction valued at more than $219,000,000. This figure was an increase of 19 per cent over 1927 and 87 per cent over 1920, when these statistics were first compiled. All provinces except New Brunswick and Quebec registered increases, the largest absolute gain being made in Ontario, where nearly half of the 1928 total construction was carried on.

Airplanes Compete With Road Job in Community Interest

Silliman & Godfrey, Inc., Build Penetration Macadam Road Passing Bridgeport, Conn., Airport and New Sikorsky Factory

ENGINEERS, superintendent and laborers were truly air-minded on the 15,972-foot penetration macadam road job that Silliman & Godfrey, Inc., Bridgeport, Conn., built from the Boston Post Road at Hard's Corners to Lordship Road in Stratford just east of Bridgeport. Mixed with the usual complaints because of the irregular delivery of stone or asphalt were comments on the flying ability of one of the half dozen aviators in the air at the time or the new bomber or 12-passenger plane to be tested the next week. In spite of this interest in the newest industry of the country, all connected with the job worked faithfully to complete the 18-foot job which was laid in one strip against earth shoulders.

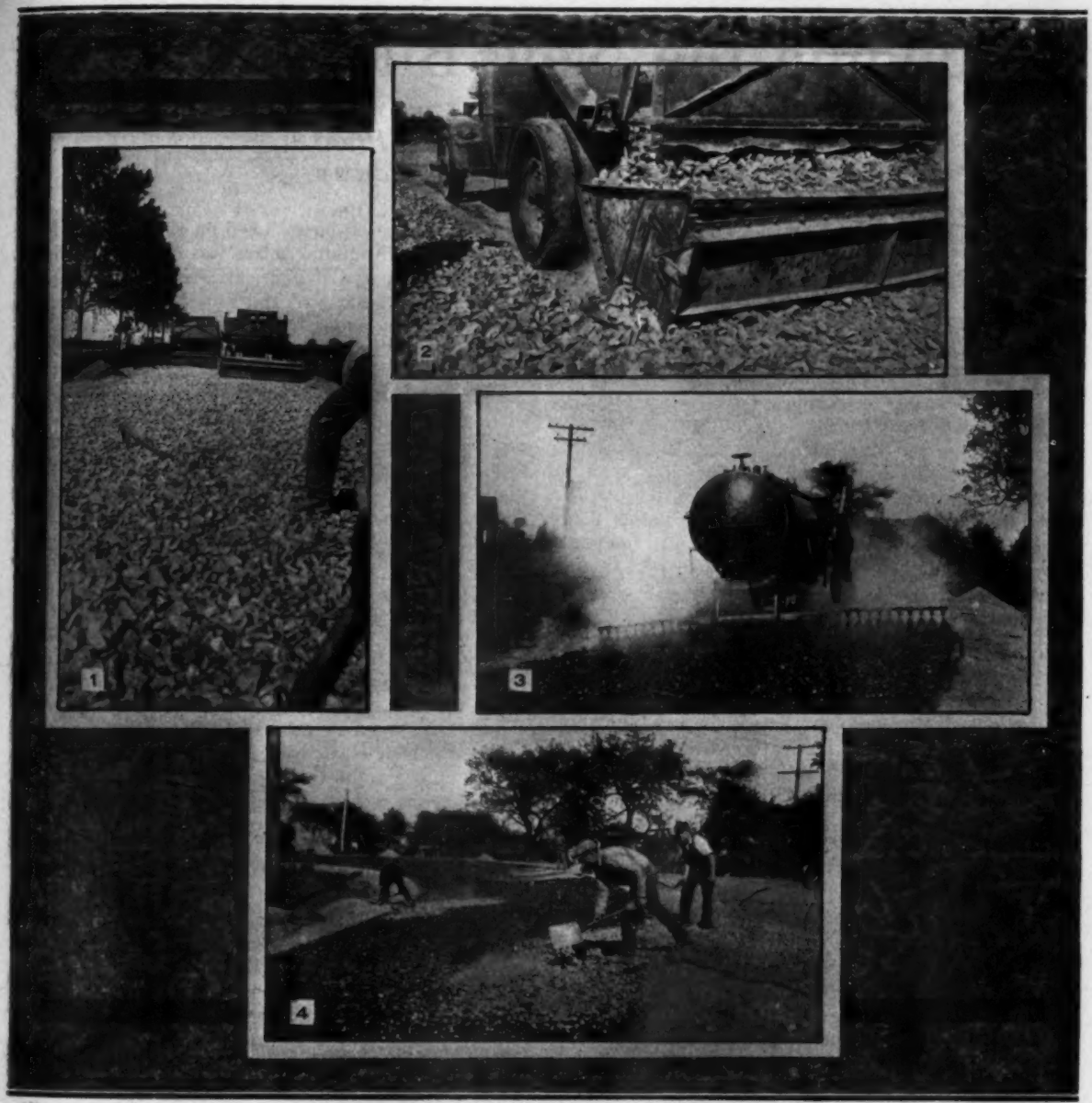
GRADING

The contract for the job was let August 28, 1929, and the work started September 4. As the major portion of the job was over an old right of way without any appreciable change in grade the actual grading operations were at a minimum. A Marion shovel was the first piece of equipment on the job followed by a Fordson one-man grader. The entire 3 miles of the job was graded in 3 weeks ready for the asphalt top.

PLACING THE 2-INCH STONE

Two-inch stone was used throughout on this job for the course aggregate. The base course was laid 5 inches deep and rolled to compaction with the three 10 and 12-ton Buffalo-Springfield rollers. Sand from a pit located at about the middle of the job was hand cast over the surface to fill the voids before the top course was spread.

The sand was secured by screening the run-of-bank material. The Marion steam shovel cast the material onto a home made sloping screen made of iron strips about ¼-inch thick and 1 inch wide spaced with washers about ¼-inch apart. The screen worked well for a while but gradually clogged and was replaced with a heavy wire screen supported by the old screen. The wire kept out the material which would clog the bar screen. The screen was mounted on posts with a slope



METHODS USED IN LAYING THE PENETRATION PAVEMENT AT STRATFORD, CONN.

1. *Two spreaders with two trucks up showing even spread of stone even between the two strips.* 2. *Detail of spreader in operation.* 3. *Socony asphalt distributor penetrating the full* 18-*foot width of pavement at one trip.* 4. *Hand casting the ¾-inch filler stone after penetration*

so that the oversize material rolled off and the sand dropped through into a truck below.

The top course stone was spread with two 9-foot Burch stone spreaders to a depth of 3 or 3½ inches and rolled to 2½ inches. All the stone was furnished by Bertollini's quarries near Bridgeport, a dead haul of 7 miles to the job. The hauling was subject on a tonnage basis.

PENETRATION

Socony asphalt for the penetration was hauled about 20 miles by Socony trucks from the main Socony plant at South Norwalk, Conn., about 20 miles away. This plant operates a fleet of about 20 trucks and supplies the entire state of Connecticut. Asphalt of a penetration of 85 to 100 was specified for this job and was applied by the distributors at a temperature from 275 to 350 degrees Fahrenheit.

The distributors applied the full 18-foot width of pavement at one trip at the rate of 1¼ gallons per square yard. This was immediately followed by the hand casting of ¾-inch stone over the surface and rolling. The seal coat consisted of ¾-gallon of asphalt with ½-inch stone hand cast over the surface and rolled at once. The application of asphalt was completed within the specified time of the State which forbids the application of penetration asphalt after October 15.

QUANTITIES

The excavation on this job amounted to 3,100 yards,

(*Continued on page 70*)

Building the New Biloxi Bridge

Contractor Had Casting Yard for Piles And a Floating Concreting Plant for Pouring Caps and Roadway

DECEMBER, 1929, will see the completion of the new reinforced concrete bridge from Biloxi, Miss., to Ocean Springs, Miss., which has been under construction by the Fuller Construction Co., of Dallas, Texas, since January, 1929. The contract for the building of the $800,000 structure was awarded in July, 1928. The first work in 1929 was the dredging of the site near the shore on the Ocean Spring side to permit the barges and other floating equipment to reach the abutments. At the same time work was started on the extensive pile casting plant in Biloxi.

Pile Casting Yard

The casting yard was built so as to extend out into the water a sufficient distance to permit the loading of the completed piles onto the barges for transportation to the bridge site. Also this feature made possible the unloading of the barges of reinforcing steel for the piles which came from Pittsburgh, Pa., and were towed all the way to Biloxi, Miss. The craneways of the yard were 700 feet long and 76 feet between rails. About three-quarters of the yard was used for the assembly of the reinforcing for the piles, the casting, cutting, dipping and storage of the completed piles until they were needed for driving.

The 25-ton, 76-foot Case electric crane performed all the functions of handling materials and unloading the raw materials and loading the completed products. The entire length of the casting yard was paved with a floor of 2-inch planks upon which the forms were assembled and the piles cast. The storage section amounting to only one quarter of the yard was not paved.

The reinforcing steel was assembled in the south end of the yard at the far end from the water. Here a group of 10 to 12 men handled the assembly of the reinforcing. At times when the casting was ahead of schedule this group was sent to the bridge to set and tie steel in the superstructure.

Most of the piles were cast across the yard but the longest piles measuring 75 feet were cast longitudinally. The piles varied from 35 to 75 feet in length, the average being about 63 feet. They were 24 inches square. The shorter piles were used in the abutments and the longest piles in the sections near the swing span at the channel.

Sand and gravel were received by rail at the casting yard and unloaded by a P & H gasoline crane with a ¾-yard Williams bucket. The crane was the only piece of equipment in the yard that was not operated by electricity. The cement was unloaded from the cars and wheeled through the cement house to the mixer when possible. The aggregate bins were wooden and equipped with wooden batch boxes made on the job. A Marsh-Capron ¾-yard building mixer was used to handle the concrete. A special cylindrical steel bucket built for this job from designs of the Fuller Construction Co., was used on the crane to take three batches at a time from the mixer to the scene of the casting.

The wooden forms for the piles were made with two holes formed by Orangeburg fiber conduits in the case of the shorter piles and three for the longer piles for use in handling the piles when cured. A special equalizer bar was used with short slings attached to bars placed through the holes to move the piles from the casting yard to cure. The forms were stripped from the piles after 6 days and the pile moved to the curing section of the yard where they remained for 30 days being wet by a garden spray and hose. In casting, the piles were cast one on top of the other to a height of four piles with only heavy brown wrapping paper between the forms and the top of the pile below. Each pile had its length, number and date of pouring cast into the top or point of the pile so that its complete history was known from the time it was cast until it was placed in the proper bent in the bridge.

The crew for the casting of the piles consisted of 2 men wheeling cement, 3 men at the batch boxes, 1 crane man on the P & H crane and 1 man on the electric crane, 1 man at the mixer, 1 man riding and dumping the bucket on the electric crane, 4 or 5 puddlers, 1 shovel-man, and 1 finisher.

After the piles had cured 30 days they were lifted by the crane and dipped in a prime coat of water gas tar in a long vat. After this had dried they were again treated by hand painting with a refined tar. The piles were then stored awaiting the call for them in the bridge structure. The piles were driven on the job by a Vulcan No. 0 pile driver. The piles were capped with a special cast steel head with wooden blocks inside for driving. The piles were lined up with a transit set on the four protruding reingorcing rods of a pile driven near the mid point of the bridge. In the other direction they were lined up with a spirit level. The outer piles of the 4-pile bents were driven on a slight batter and the two center piles vertically. A number of the 24-inch piles were jetted into place in addition to driving.

The Floating Concrete Plant

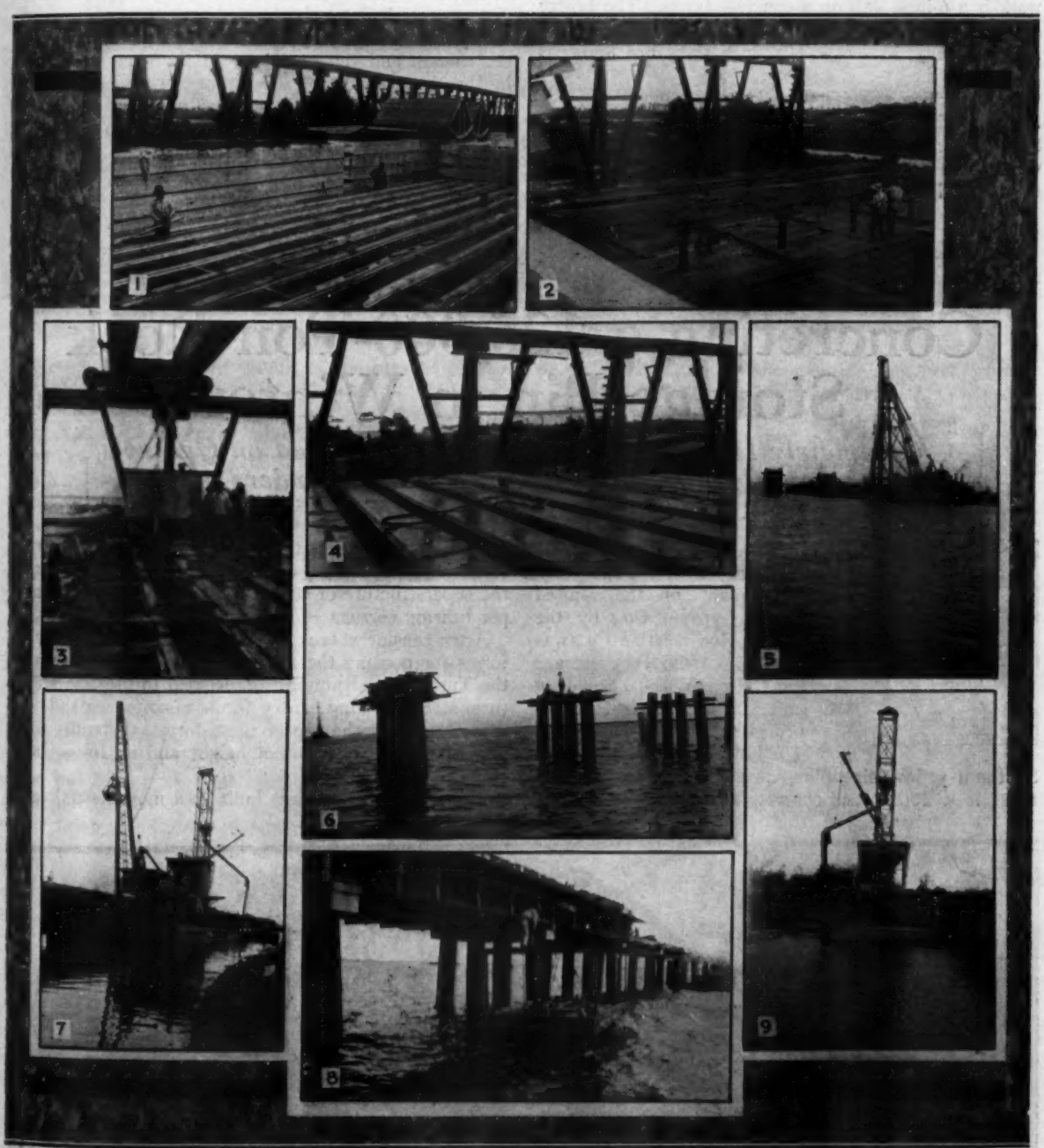
A well-designed floating concrete plant was developed for this job. It was mounted on a 32 x 90-foot wooden barge and so arranged that materials from barges could be handled with the minimum of effort and in the quickest possible time. When in operation the sand and gravel barges were lashed together and moored in front of the concreting barge with the cement barge alongside at the left. A Dobbie derrick operated by a Mundy hoist and equipped with an Owen ¾-yard clamshell was used to load the aggregate from the barges to the Blaw-Knox bins and batchers. The derrick was

full-revolving and thus was able to reach in any direction from the setting at the front of the barge.

Cement was handled in wheelbarrows direct from the cement barge to a shed back of the derrick by one or two men. One man in the cement shed loaded the cement bags into an elevator which discharged the load onto the mixer platform above. The elevator was operated by the same engine used to hoist the concrete in the tower through a power takeoff.

The Jaeger ½-yard mixer discharged into the Insley concrete bucket which ran up the tower and delivered the concrete to the caps or floor system through a maximum of 50 feet of chute. Water for the mixer was secured through a 2-inch line cut into the city water line but when the work was beyond this line a Myers Bulldozer pump with an Alamo engine mounted at the rear of the barge was used to pump from a water barge moored alongside.

The crew used to operate the concreting plant on the barge consisted of 1 crane man, 2 men wheeling cement,



OPERATIONS IN THE CONSTRUCTION OF THE BILOXI BRIDGE

1. Assembling the forms for the 75-foot concrete piles. 2. Preparing the reinforcing for the piles. 3. Pouring the concrete piles. 4. Lawn spray used for keeping the piles wet during the curing period. 5. Driving one of the 75-foot batter piles. 6. Assembling the forms for the caps on the pile bents. 7. The loading end of the floating concreting plant. 8. The floating platform used by the carpenters when working on the forms for the sidewalk and roadway. 9. The pouring end of the floating concreting plant

2 men dumping cement into the hopper above the mixer, 1 man on the batchers who also dumped the mixer, and 1 man on the concrete hoist.

THE FLOOR SYSTEM

Three 18-inch I-beams and one 22-inch I-beam was used as false work to support the concrete deck being poured. The deck is of concrete T-beam construction. The roadway deck of the concrete spans is composed of an 8-inch slab with three concrete T-beams and the sidewalk is a 6-inch slab on a concrete beam. The bridge has a 20-foot roadway, a 4-foot sidewalk and the spans are uniformly 36 feet. The floor slabs are 8 inches thick.

For handling the form work on the outside of the bridge, scaffolds hung from the caps would have been hazardous so the contractor devised a floating scaffold which was used throughout the work without any trouble and with perfect safety by the carpenters.

THE CENTER SWING SPAN

A 280-foot center swing span giving two clear channels of 120 feet each is located about one-half way from each shore line, and is now under construction. The deck slab is 6 inches thick, and steel grating is used for the sidewalk. The steel work on the center swing span was subbed to the International Steel & Iron Works, Evansville, Ind. The Fuller Construction Co., handled all the work on the piers for the swing span.

A caisson 30 feet in diameter was driven with 14-inch Larssen steel sheet piles 60 feet long. The seal was poured by the floating plant using a tremie to a depth of 16 feet. This seal was on 107 wooden piles. After the concrete had set the caisson was pumped out with a 6-inch centrifugal pump mounted on the framing above the caisson and the remainder of the concrete poured in the dry. The steel sheet piling was left in place around the pivot pier to serve as a protection to the concrete against the sea-water action and also to prevent scour under the pier during hurricanes.

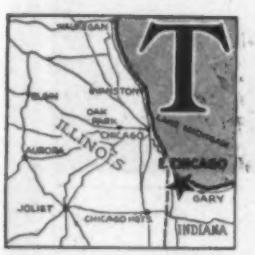
PERSONNEL

The work on the substructure and the entire bridge with the exception of the swing span was done by the

(*Continued on page 62*)

Concreting a 125,000-Ton Rock Storage Bin in Winter

Completely Housed Steel Forms Moved Ahead on Gantry and Heated With Steam and Salamanders to Insure Perfect Setting



THE outstanding feature of the construction of the new Chicago plant of the United States Gypsum Co., by the Turner Construction Co., was the 125,000-ton rock storage bin. The bin is 460 feet long and 104 feet wide and approximately 112 feet high. The bin is supported by 4,028 Southern yellow pine piles varying in length from 60 to 80 feet. Reinforced concrete retaining walls 40 feet high of the cantilever type form the base of the structure on top of which, rising to a height of 70 feet, is the superstructure of structural steel covered with copper bearing corrugated steel roofing and siding.

After considerable study in connection with suitable forms for pouring the mass concrete of the side walls, the Turner Construction Co., decided to use two structural steel traveling gantry forms mounted on rails for movement. By the use of these forms, the walls were poured for the full 40-foot height and in 20-foot sections.

The concrete tower was built as a movable unit and

The Central Mixing Plant

Construction View Taken January 16, 1929, *Showing One Gantry Set Up and Wall Forms in Place*

was moved on rails to the middle of the bins, as pours were made along the side walls. The concrete was carried on 1-ton trucks from the central concrete plant to a hopper at the base of this wall and elevated and then spouted to the wall forms.

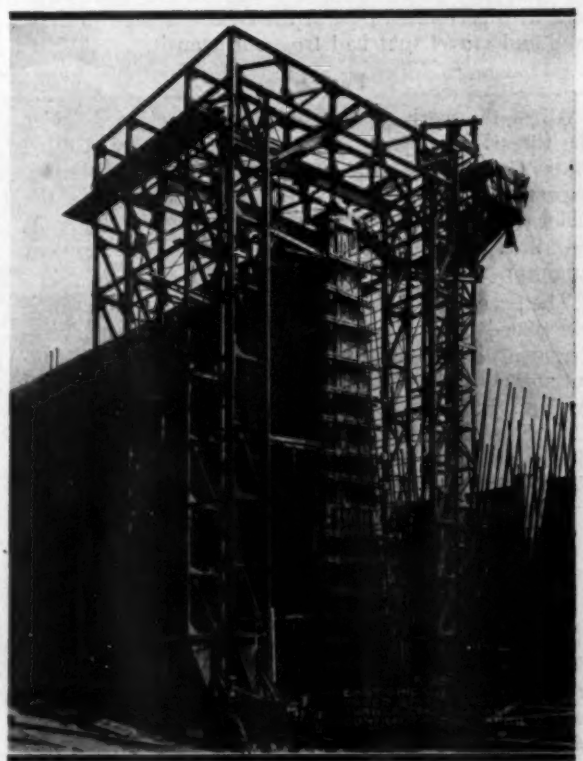
METHODS USED TO PREVENT FREEZING

One of the difficult problems in the pouring of the mass concrete in the side walls was to prevent freezing of the wet concrete. A 20-horsepower vertical type steam boiler was set on a log sled and by means of a hand winch was drawn along as the work progressed. After the forms were in place for a footing, steam hose lines were run from the boiler into the forms and the ice or snow thawed. Then the reinforcing bars were set in place and the framework that supported the bars was covered with winter weather canvases. Salamanders were then placed at the bottom of the footing and kept under full fire so that concrete could be poured the following day. By opening up the canvases at one end of the footing the automobile trucks transporting the concrete were able to back under the tent of canvas and dump their loads. After the footing was poured the salamanders were equally distributed over the top of the footing and the end canvases let down.

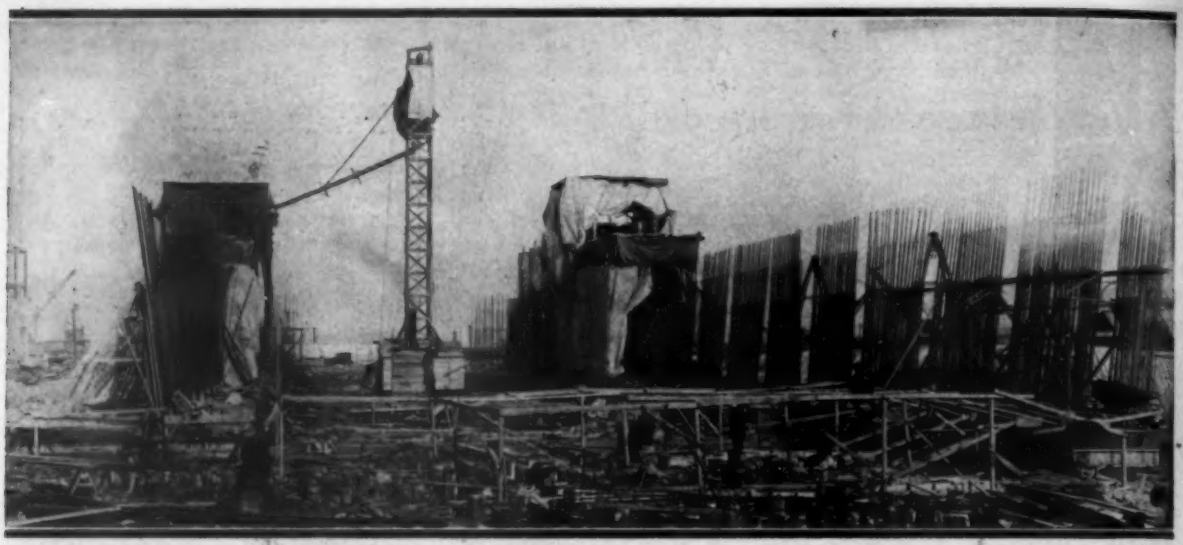
WINTER WORK ON THE WALLS

For the wall pours the steel gantries were completely enclosed with canvases securely fastened and at the wall bottom as many as 30 salamanders were kept hot inside the winter weather canvases. Of 15,000 cubic yards of concrete in these rock storage walls and footings, 12,000 cubic yards were poured during the winter months and required winter weather protection.

The procedure on the wall pours was as follows: On the first day the concrete was poured in a section; on the second day the forms were stripped and set up in the next section; and on the third day an additional section was poured. This procedure permitted five wall pours per week as there were movable forms for both side walls. To facilitate the spouting of concrete from the concrete tower to the wall a 1¼-inch steam pipe was carried from the boiler up a leg of the concrete tower to the concrete hopper at the top of the tower. At this point a T was placed on the steam line with a valve on each side of the T. One branch of the steam line was used to allow steam to pass into the concrete hopper. The other branch was made up of the length of



Construction Detail Showing the Steel Gantry and Wall Forms in Place



Winter Construction on the Gypsum Co.'s Concrete Storage Bin

steam hose on the end of which an 8-foot length of pipe was joined. When the concrete clogged in the spout, the flexible steam line was used to good advantage in breaking loose the concrete.

At the central mixing plant, a 40-horsepower steam boiler supplied steam to coils in the sand and gravel hopper and batch water barrel. Steam jets were kept in place in the sand and gravel storage bins. A complete housing was built over the sand and gravel siding to enclose four cars and salamanders were set at track level along each side of the cars in this housing to keep the sand and gravel from freezing. A 1¼-inch steam hose with perforated pipe at the ends was used to thaw sand and gravel that had frozen in transit.

Personnel

All of the work on this project was designed under the direction of J. H. Nold, Chief Engineer, United States Gypsum Co., who was assisted by E. B. Johnson, Supervising Engineer, S. L. Griffith, Assistant to the Chief engineer, J. M. McGee, in charge of design, A. A. Frosdick, Works Manager, and R. W. Lee, Resident Engineer.

The personnel of the Turner Construction Co., which functioned under the direction of J. P. H. Perry, Vice-President, included: J. C. Grady, General Superintendent and Operating Manager; E. K. Abberley, Engineer; William E. Nash, Purchasing Agent; E. K. Dewey, Field Superintendent; J. T. Blomquist, Machinery Engineer, and J. S. Hewson, Assistant Superintendent in charge of subcontracts.

Building the Biloxi Bridge

(Continued from page 60)

Fuller Construction Co., of Dallas, Texas, under the direction of G. W. Courter, Chief Engineer, with J. A. Cooper as Superintendent. The International Steel & Iron Works, Evansville, Ind., were contractors for the swing span. The pile driving was done by William Moore Construction Co., Houston, Texas. J. B. Craig was Project Engineer for the State Highway Department of Mississippi.

An Incentive for Better Pavements in California

THE California State Department of Public Works has recently published its construction records for 1928. The publication of these records is notable, not for the broadcasting of remarkable figures but rather for the fact that they list the contractors and engineers who are responsible for the best pavements as well as for the production of the best daily yardage.

First in the list of asphaltic concrete and for portland cement concrete are the contractors and the resident engineers on the projects which had the best records for smoothness. Inasmuch as smoothness is the quality of a pavement which sells it best to the public, this item should receive more attention from contractors and state highway engineers.

Second on the list for asphaltic concrete is the record for the best hand finished job, and third the record for density of pavement surface. Both of these are qualities which show the nature of the work of the contractor, show his interest in his work, and also go to furnish the best riding and most lasting pavement. In the case of the portland cement concrete, the second item is the record for average concrete strength which contributes to the life of the pavement.

The third item under both types of paving refers to the daily yardage or record for production which reflect the organization and management of the contracting organization.

We reproduce below the statement as published in *California Highways and Public Works*, published by the State Department of Public Works:

PORTLAND CEMENT CONCRETE

Record for smoothness—Resident engineer, C. M. Butts; Fredrickson & Watson Construction Company, contractor; contract between Galt and Arno, Sacramento County.

Record for average concrete strength—Resident engineer, F. C. Forgate; Hanrahan Company, contractor; contract between Ignatio and Gallinas Creek, Marin County.

Record for daily yardage—Resident engineer, C. M. Butts; Fredrickson & Watson Construction Company, contractor; contract between San Joaquin River and French Camp, San Joaquin County.

ASPHALTIC CONCRETE

Record for smoothness—Resident engineer, W. D. Eaton; Gibbons & Reed, contractor; contract between Monrovia and Arnuo, Los Angeles County.

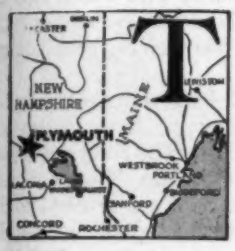
Record for best hand finished job—Resident engineer, J. F. Knapp; California Construction Company, contractor; contract between the country fair grounds and Hanford, Kings County.

Record for density of pavement surface—Resident engineer, J. M. Hollister; John & Bressi, contractor; contract between Seeley and El Centro, Imperial County.

Record for production—Resident engineer, W. D. Eaton; Gibbons & Reed, contractor; contract between the county fair grounds and Hanford, Kings County.

A Sand and Gravel Pit and Paving Operation in New Hampshire

Arborio Construction Co., Hartford, Conn., Lays Pavement on Scenic Highway in White Mountains a Well-Planned Job Throughout



TEAM-WORK with a genuine spirit of pulling together were very much apparent on the 2.7-mile Federal Aid Project 228-E near Plymouth, New Hampshire, being built by the Arborio Construction Co., Hartford, Conn. The friendly rivalry of the truck operators in trying to get in an extra load of material and instances such as the shovel operator in the pit finishing his lunch and then, instead of loafing around waiting for the end of his period of rest, taking a shovel and clearing up in front of the shovel so that there would be a clear space for the crawlers when he needed to move nearer the bank, these showed the fine spirit that ran through the entire organization and which was the main reason for the completion of the concrete pouring on the two previous jobs between Lancaster and Whitefield, a distance of 7½ miles in 59 working days. By completing these jobs in good time they were able to handle the Plymouth job without rushing before freezing weather.

All equipment was well cared for. Every piece of machinery was well oiled to prevent dirt and concrete from sticking to the metal and speeding the depreciation of the machine. During the noon hour, and the Arborio organization has a full 60 minutes for lunch, each piece of machinery was gone over to see if there were any adjustments needed to insure full production during the afternoon. Does it pay? Ask any member of the Arborio organization. The long noon hour gives every man a chance to rest and to be ready for the afternoon fresh and free from fatigue. The paver is stopped for the full 60 minutes and the sand and gravel pit operations are shut down for the same period, but the fine grading and form-setting crew takes only 30 minutes for lunch and rest.

Rough Grading

Although the major part of the project was over an old right of way there was considerable grading to be done in removing some high spots in the grade on rock ledge and widening the old grade. Two P & H diesel-powered shovels, one Model 600 and a Model 700, were used to handle the grading. Where fill was necessary the shovels loaded 3-ton Mack trucks which hauled to the site of the fill. Where there was an unbalanced cut and fill with more fill needed material was hauled direct from the sand and gravel pit to make up the balance.

All fill was spread with a McCormick-Deering trac-

GRADING AND WATER SUPPLY FOR THE PLYMOUTH, N. H., CONCRETE ROAD PROJECT

1. Hauling fill and spreading with a McCormick-Deering tractor equipped with H-P crawlers and a LaPlant-Choate bulldozer. 2. One of the P & H shovels handling large stone from a blasted ledge. 3. The Barnes 3½-inch centrifugal with a LeRoi engine supplying water for washing the aggregate

tor equipped with H-P crawlers and a LaPlant-Choate bulldozer. A Buffalo-Springfield steam roller with scarifier was used to roll the fill and to loosen the top where light cuts were needed. On rock cut an Ingersoll-Rand portable compressor was used with jackhammers preparatory to light blasting.

FINE GRADING AND FORM SETTING

The rough grade was left in such good shape that there was little need of heavy equipment on the fine grade. A H-P one-man grader made the final cut and the spoil was shoveled out by hand. A crew of about 12 men was used in this operation and a Buffalo-Springfield steam roller was maintained to compact the final grade.

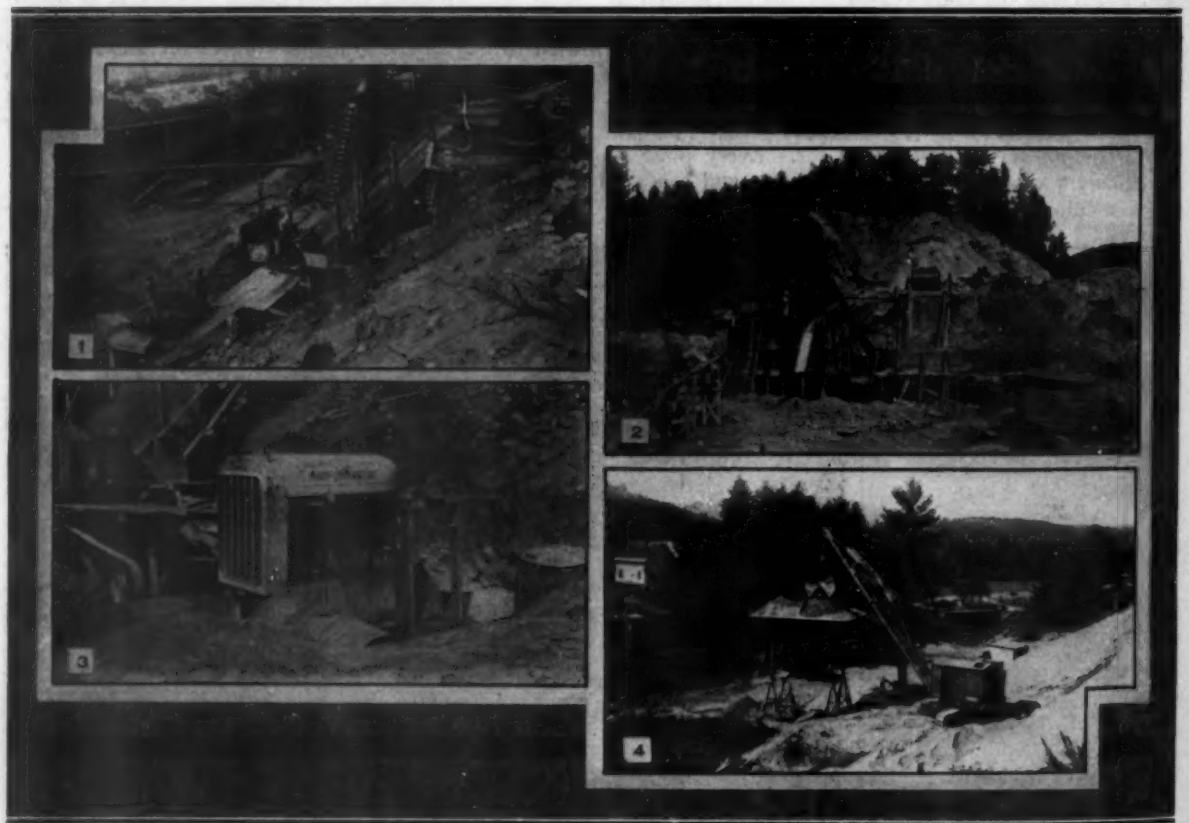
The cross-section of the concrete slab measures 9 inches thick at the edge reducing to 6 inches at a point 2 feet from the edge. The thickened edge section was planed out by one of the H-P one-man graders. The Blaw-Knox steel forms were set on the two edges of the slab measuring 10 feet wide, using 9-inch forms at the outer edge and 6-inch forms at the inner edge for the first slab and when the second was poured the first slab was used as the form.

COMPLETE SAND AND GRAVEL PLANT

To furnish sand and gravel for the concrete and excess fill for the grade the contractor leased a sand and gravel pit on a per yard basis and placed his own crushing, screening and washing plant in it. The pit was in a side hill with sufficient elevation so that the excavated material could be run to the crusher by gravity. A Model 600 P & H shovel loaded a Chevrolet truck which shuttled between the shovel and the chute to the crusher. The shovel loaded two other trucks which hauled to fill, but as needed one of the other trucks was dumped at the crusher chute. All the trucks were equipped with Wood hydraulic hoists. The chute ran over a grizzly of punched iron plates with 1-inch round holes supported by a grill of industrial railway track. This permitted the fines to fall through without going to the crusher.

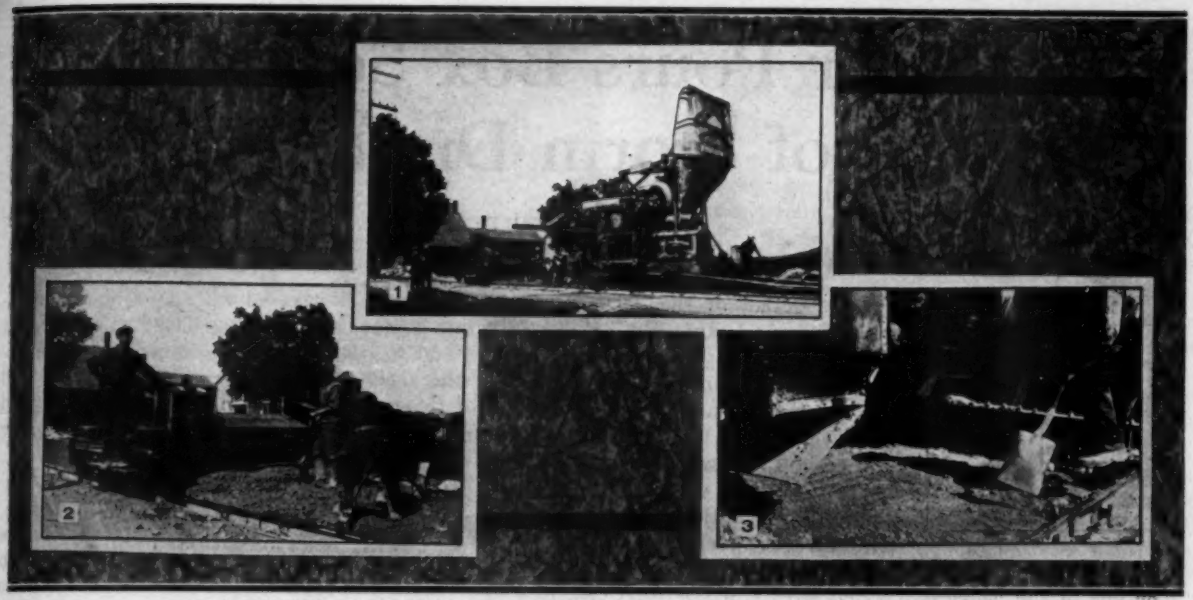
A complete Acme crushing and screening plant handled the stone and sand, crushing the larger material and screening the whole into bins. The sand was run to the washer and thence back to the bin. Two or three trucks, as needed, were used to haul the crushed and screened stone and sand from the bins uphill to sidehill dumps for storage. From the storage piles a P & H model 600 crane with a Blaw-Knox Dreadnaught bucket moved the sand and crushed stone to the Blaw-Knox bins which were equipped with weighing batchers.

At the pit which was located about two-thirds of the way from the north end of the job the operating crew consisted of 1 shovelman and 1 part-time laborer in the pit, 1 man on the storage piles, 1 man on the



THE SAND AND GRAVEL PLANT NEAR PLYMOUTH, N. H., OPERATED BY THE ARBORIO ROAD CONSTRUCTION COMPANY FOR THIS JOB

1. View from the grade elevation of the pit showing a truck dumping pit run sand and gravel into the chute to the crusher. 2. Looking at the chute and showing the bucket elevator and screening plant at the left with trough for disposal of wash water at the extreme left. 3. The Waukesha power plant which ran the crusher, elevator and screens. 4. The P & H 600 loading the Blaw-Knox bins from side hill storage



PAVING OPERATIONS ON THE ARBORIO CONTRACT AT PLYMOUTH, N. H.

1. The Ransome 27-E paver with the skip up. 2. The Ord finishing machine handling the stiff mix. 3. The scratch board behind the mixer owned by the New Hampshire State Highway Department and furnished to contractors without charge, to prevent any misunderstanding in checking the final grade

crane and 1 man at the batcher, 2 men at the crusher, 1 man loading trucks at the bins, 1 mechanic and the foreman, Angelo Marone, whose duty it was to see that the entire plant was operated at the most efficient speed.

About 2,500 feet of forms were maintained on the job and were kept set about 400 feet ahead of the paver at all times.

POURING AND FINISHING

A fleet of from 3 to 10 Mack trucks hired at a per batch rate hauled the batches from the proportioning plant to the paver. They backed under the batcher, received the three batches and then pulled out to the freight cars about 200 feet away. No cement storage was maintained but there were from one to four freight cars of Dragon cement on the siding at all times. Two men unloaded the cement in paper bags to the batch trucks, 7 bags per batch. The trucks made the haul to the paver, turning through the forms on the firm subgrade. Just before the trucks turned around two men climbed aboard and emptied the bags of cement into the batches. One man dumped the trucks at the paver. A rather stiff mix was used that had to be shoveled to place it for the American Steel & Wire Co., reinforcing fabric. The fabric was placed 2 inches from the top of the slab on the roughly shoveled concrete before any tamping or screeding by the finishing machine. A Ransome 27-E paver was used with a batch meter timed for a minute and fifteen seconds mix.

The State of New Hampshire Highway Department furnishes the contractor with a scratch template or drag board which is attached to the paver and dragged after it to check the final subgrade. In addition to the man dumping the trucks at the paver and the paver operator, two men were used to shovel from the final grade to give the exact grade. The remaining crew at the paver consisted of 1 man to operate the Ord finishing machine who also shoveled as needed to the screed with a laborer, and 3 men shoveling the concrete to place as spread by the Ransome paver bucket. The men who handled the final grade also set the reinforcing steel and the expansion joints.

Carey Elastite expansion joint ½-inch thick was used and set with a bulkhead to which the expansion material was attached by two hand clamps. Five 2-foot dowels, one-half of each of which was oiled to prevent the concrete adhering to the metal were inserted through the expansion joint to bond the adjacent slabs. Three iron stakes were driven on the side away from the concrete to hold the bulkhead in place and the first batch of concrete poured after the expansion joint was set was shoveled against the joint to hold it on that side.

HAND FINISHING AND CURING

Following the Ord finisher were two hand finishers and a helper for edging and finishing expansion joints. One man spread the hay over the surface as soon as the initial set was noted and the hay was then sprinkled for seven days at the end of which the pavement was cleaned and opened to traffic. The state specifications call for a mix in the proportions 1 : 2¼ : 3¾ to make this possible.

WATER SUPPLIES

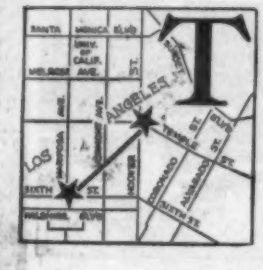
In order to keep the paver and the curing supplied with water and the washer at the pit it was necessary to keep two pumps at work. For the washer at the pit a Barnes 3½-inch centrifugal with a LeRoi engine was set at the edge of the stream about 400 feet from the pit. The water for the paver was secured from the same stream where it came close to the road. A Barnes road pump was used with 2½-inch pipe. The taps for the paver hose and the sprinkling were located 250 feet apart.

(Continued on page 70)

Paver Pours Box Section of Storm Drain

By C. D. Curry

Estimator, Charles H. Johnston, Contractor



THE box section of the Sacatella Storm Drain No. 3 which was recently completed in Los Angeles starts just east of the intersection of Hoover and Temple Streets and runs in a general southwesterly direction to connect with the existing drain at Sixth and Mariposa Streets. Section No. 3 runs east on Sixth Street from Mariposa to Kenmore on one of the heaviest traveled streets in Los Angeles and then north through a heavily built up apartment house district.

The excavation required practically one half of the surface area of the streets making the problem of the distribution of the equipment and materials along the way one of much importance. The cross-section varied from 10 to 12 feet wide and from 8 to 10 feet high inside measurement, with 10 to 13-inch walls.

The excavation was handled with a 1¼-yard Koehring dragline loading into trucks which hauled the dirt to dumps and to backfill on the completed work. Because of the small available street area only a small portion of the total excavated material could be piled on the job. Vacant lots afforded some storage room for material which was later used for backfill.

Vibration of Street Cars Formed a Hazard

On Sixth Street between Mariposa and Kenmore the work required excavating from behind the existing curb to partly under the north tracks of the Los Angeles Railroad Co.'s lines. The street car company diverted its cars to the south tracks around the work by means of shoeflies, thus lessening the vibration on the sides of the trench and permitting shoring to be moved and replaced during the progress of setting the forms.

The precaution taken by the street car company turned out to be very wise. At the time of year that this part of the work was under way, March, danger

A Shovel and Three Draglines Speed Trench Excavation

A Deep Cut and Bracing on the Sacatella Storm Drain Through a City Street

from rain and floodwaters was great. A heavy rainfall of 2 inches in 24 hours took place and some washouts occurred under the north tracks of the surface lines, but by prompt cribbing the tracks were satisfactorily maintained.

Wherever ground water was encountered an 8 to 10-inch concrete pipe was laid with open joints below the subgrade of the main drainage box, its trench being filled with rocks. This feature provided a dry subgrade on which to lay the invert of the drain.

WALL STUB GUIDES FORMS

As the invert was poured a stub wall 6 inches high was also poured. This stub was used as a guide to line up the inside and outside forms.

The inside forms were Blaw-Knox steel ribs covered with 2-inch siding and the whole covered with 20-gage sheet iron. These forms were in 20-foot sections and some difficulty was encountered in moving them around curves. It was found that an 80-foot radius curve was the minimum around which the 20-foot forms could be moved without bending down the vertical wall reinforcing steel.

The outside forms were made up of sections 4 feet long and 12 feet high. This height was sufficient to extend high enough above the inside forms to take care of the varying thickness of the roof slab of 16 to 25 inches.

PAVERS USED TO MIX CONCRETE

The concrete for the box section was mixed by pavers, handling 6-bag batches of 1:2:3½ concrete and depositing it by steel chutes from the paver bucket direct to the forms. The pavers traveled along the edge of the excavation as the forms were filled. By this method of mixing and placing an accurate control of the concrete going into place was maintained. Cement sufficient for each day's run was stockpiled along the trench and was hand dumped into the skip.

OPEN CUT THROUGH NEW FILL

An interesting problem was encountered in crossing Vermont Avenue. At this point the city of Los Angeles had just completed a 16-foot fill 100 feet wide at the top, laid with the old pavement as the base. While this fill was under construction, the Los Angeles Railroad Co., drove post bents 34 feet apart to carry their tracks and cars during the construction of the storm drain, the bottom of the posts resting on the old concrete street surface. It soon became apparent that there was not a safe bearing for the falsework and so street car traffic was abandoned over the cut and passengers crossed on foot.

A careful analysis of costs show that the open cut would be much cheaper than tunneling at this point. The additional filled material involved some 10,000 cubic yards. As this was an entirely new fill, it was very unstable and some slides occurred. The cut at this point was about 35 feet. This depth required a double handling of the material. Two draglines working side by side took out the cut and cast it to the limit of their 50-foot booms where it was picked up and cast again in order to provide for an average slope of ¾ to 1. The material directly under the tracks was removed by hand to a point where a clamshell could reach it.

WORK IN TUNNEL

Where the drain crossed the intersection of Temple

Carriage for Handling Forms Ran on Tracks Laid on the Invert

Framing of Forms for Pouring Top of Box Culvert and Chute Piercing Roof for Delivery of Concrete

and Hoover Streets, the plans called for a tunnel. The cover over the top of the timbering was about 10 feet. Two street car lines and heavy traffic overhead made it necessary to provide extra heavy timbering. The clear inside dimensions of the tunnel were 12 feet wide by 16 feet high. In spite of the fact that 8 x 1-inch posts with 8 x 10-inch mud sills on 4-foot centers were used with 2-inch lagging between, the timbers showed a slight bending and settlement indicating an unstable ground.

To pour the walls and top of the box through the tunnel section presented a difficult problem. This was met by using a common well drilling rig drilling 24-inch holes at intervals along the center line of the drain. The concrete was poured directly into the holes and was distributed by chutes directly from the holes into the forms. Sufficient headroom was allowed between the top of the box and the roof of the tunnel for men to work. This space was later backfilled with crushed rock.

The box section was approximately 8,000 feet long and required 120,000 cubic yards of excavating and 20,000 cubic yards of concrete.

PERSONNEL

Charles H. Johnston did the work under sub-contract from the J. F. Shea Co. H. J. Brown was the Superintendent in charge for the contractors and A. Bradbeer was Senior Inspector on the job for the city of Los Angeles.

ACKNOWLEDGMENT.—Text, courtesy of *The California Constructor*. Photographs through kindness of Charles H. Johnston.

The world bestows its big prizes, both in money and honors, but for one thing. And that is initiative.

—ELBERT HUBBARD.

Paver Running on the Bank Pouring Box Culvert Section by Chutes, the Top One Supported from the Paver Boom

Safeguards to Make Machines Safe

By Eric H. Lichtenberg

Chief Engineer, Koehring Company, Milwaukee, Wis.

IT is now pretty well known what education for safety has done, and may still do, for the construction industry. The contractor is receiving tangible benefits in the form of lower insurance rates and a decrease in lost time accidents. The employer has benefited both economically and psychologically. Yet the fact remains that the construction industry is still one of the most hazardous, due to its very nature, and due to the fact that one job is seldom the same as another.

Materials Cannot Fall From This Cage to Injure Those Below. An Insley Material Cage with Top and Side Screens to Protect Men on the Platform from Material Falling from Above. It Also Protects Men Below from Material Falling from the Platform

Individual Responsibility

The most effective method of eliminating accidents is to create an attitude of responsibility in each individual for preventing accidents. This not only applies to the individual on the job but also to everyone contributing to it. Thus it includes the individuals connected with the manufacture of construction equipment. Yes, even the neglect of the humblest man may contribute to a serious accident. We have all heard of accidents that could be traced back to some insignificant thing like a cotter pin that was not properly opened.

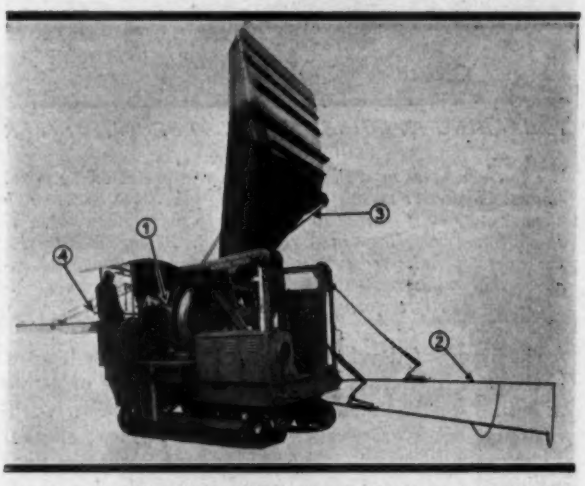
The old German proverb about the horse-shoe nail might be paraphrased to fit the situation:

For want of a bend the cotter pin was lost
For want of a cotter pin the clevis was lost
For want of a clevis the brake rod came off
For want of a brake rod the dipper came down
And smashed a truck, and killed two men
And all for want of a cotter pin bend.

Consequently the most effective method of eliminat-

SAFETY DEVICES ON A POWER SHOVEL

The boom on this shovel and crane is prevented from dropping by two mechanisms for safety. One is the pawl ratchet on the boom hoist drum which locks the drum and prevents the hoist cable unwinding and the other is the self locking brake which must be deliberately released by the operator in order to lower the boom. Large, adequate guards may be seen through the cab door covering the moving gears so that the operator may walk around the cab without danger of catching his clothing on these parts. Another safety feature is a hand rail around the outside of the motor



A 27-E PAVER SHOWING A NUMBER OF SAFETY DEVICES

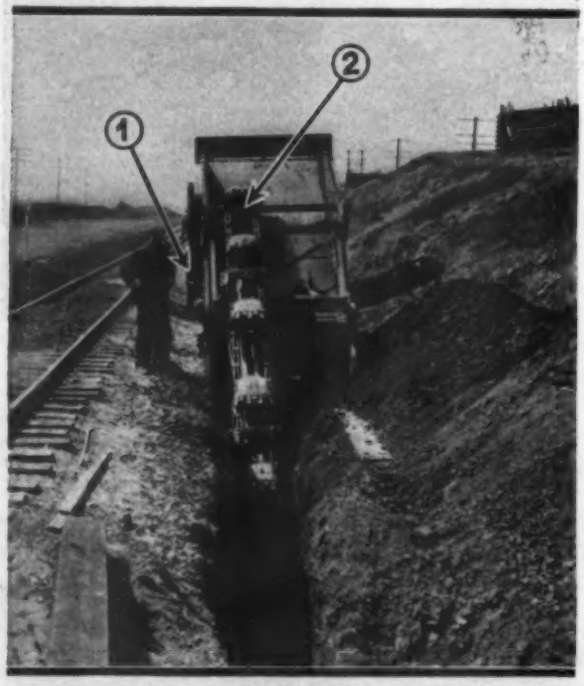
1. A heavy sheet metal guard over the drum drive gears and drum drive pinions prevents the operator from coming in contact with any moving gear teeth. 2. The charging skip guards automatically rise to a waist high position when the skip is charging, warning workmen that this space is reserved for the skip, when it is lowered. 3. Double continuous skip hoist cables form a cradle under the skip. One cable is strong enough to hold a loaded skip should either cable break from wear. 4. A railing on the paver platform prevents the operator falling to the ground if he should lose his balance. A Klaxon conveniently located on the platform may be sounded by the operator when moving the paver or running out the bucket

ing accidents is to create an attitude of responsibility all along the line, in each individual for the guarding of his own safety and that of others.

THE MANUFACTURER'S RESPONSIBILITY

Now let us see how the manufacturer is meeting this responsibility. First he is aiming to make everyone in his organization safety-minded. Second he is trying to produce machines that are as safe to use as possible.

The illustrations show in detail some of the results of these efforts. The ultimate aim of the manufacturer is to make the guards on his equipment a part of the machine.



TRENCHING MACHINES MAY ALSO BE MADE SAFER FOR OPERATORS

1. The chain drive on a Parsons trencher is protected by metal guards. There are no over-hung moving parts that might catch a man's clothing if obliged to pass close to the machine. 2. The off-set boom provides added safety when digging near tracks. The off-set permits greater distance between track and excavator so that trains can pass the machine safely and without interfering with its operation

The trend of development is toward enclosed gears. The transmission running in oil is an example of safety built into the machine. Much safety equipment is still auxiliary, however, and when such is the case, all that the manufacturer asks of the contractor is that he keep the guards on; and when necessary to remove them, that they be replaced before the equipment goes back into service.

ACKNOWLEDGMENT.—From a paper presented before the Construction Division of the National Safety Council.

A Sand and Gravel Pit

(*Continued from page 65*)

STEADY PROGRESS

The Arborio organization does not believe in stressing paving records. They feel that a steady progress of slab poured is better than a phenomenal run for one day and minimum runs for several days because of breakdowns. This spirit is reflected in the average run of the organization on this job, about 1,575 feet per nine-hour day.

PERSONNEL

This job was constructed under the direction of Harry L. Smith, Division Engineer, New Hampshire Highway Department. For the Arborio Road Construction Co., Joe Vercelli was in charge of all grading operations and Jack Costello in charge of the paving operations. John Arborio is President, Joseph Arborio, Vice President and William Lee, Treasurer.

Airplanes Compete With Road Job

(*Continued from page 57*)

the stone for base and top courses 14,000 tons, and the asphalt 80,000 gallons. There were 14,500 yards of borrow which was obtained from two pits on the job and by widening the cuts. A total of 33 men was the maximum payroll on the job.

The maximum day's operations in the application of asphalt were on September 23 when 9,000 gallons were applied and on September 24 when 11,000 gallons were used. On September 19 a fleet of 11 trucks hauled and spread 692 tons of stone on the road.

PERSONNEL

J. S. Trumbull was Superintendent for the contractor, Silliman & Godfrey, Inc., Bridgeport, Conn., and Walter Maynard was Inspector for the State Highway Department under the direction of Myron Tyack, Assistant to the Division Engineer.

Winter Is Vital—Not Dead

TIME was when the building industry quit cold when the first snow flew. Laborers lost their jobs, expensive equipment depreciated in idleness, overhead costs piled up, the buying capacity of millions was cut down and every aspect of business, from the corner grocery to the opera, suffered. Needed improvements remained undone, costly land produced only bills for taxes due; in short, construction work stood still, waiting for spring. And when spring came, there was a mighty rush for labor, materials, engineers and all the rest—a spectacle impressively unintelligent.

Nowadays winter is recognized as an asset, not a liability. Modern equipment scorns the difficulties of winter construction; modern workers are efficient in winter and their jobs reflect that efficiency. The precautions that must be taken are simple and financially negligible, for they are more than overbalanced by the profits involved. Capital gains, labor gains, communities profit and the whole organization of the modern world is toned up.

The sane common sense of business has ironed out the folly of the winter slump.

Crane Sets Stone on Church Steeple 121 Feet High

CHRIS KANZLER & SON, Evansville, Ind., recently completed a brick, steel and stone church in Evansville, according to the *Hercules Record*, which involved a rather unique material handling problem.

In order to handle the stone on the steeple which rose to a height of 121 feet, a 93-foot wooden extension was added to the 70-foot boom of the Moore Speedcrane. This extension was supported by horizontal and vertical spars and truss rods. Some of the individual stones on this structure weighed up to 3½ tons. All stone was not only hoisted by the crane, but was accurately set in place on the mortar bed.

Paving Outfit Organized for 125 Feet Per Hour

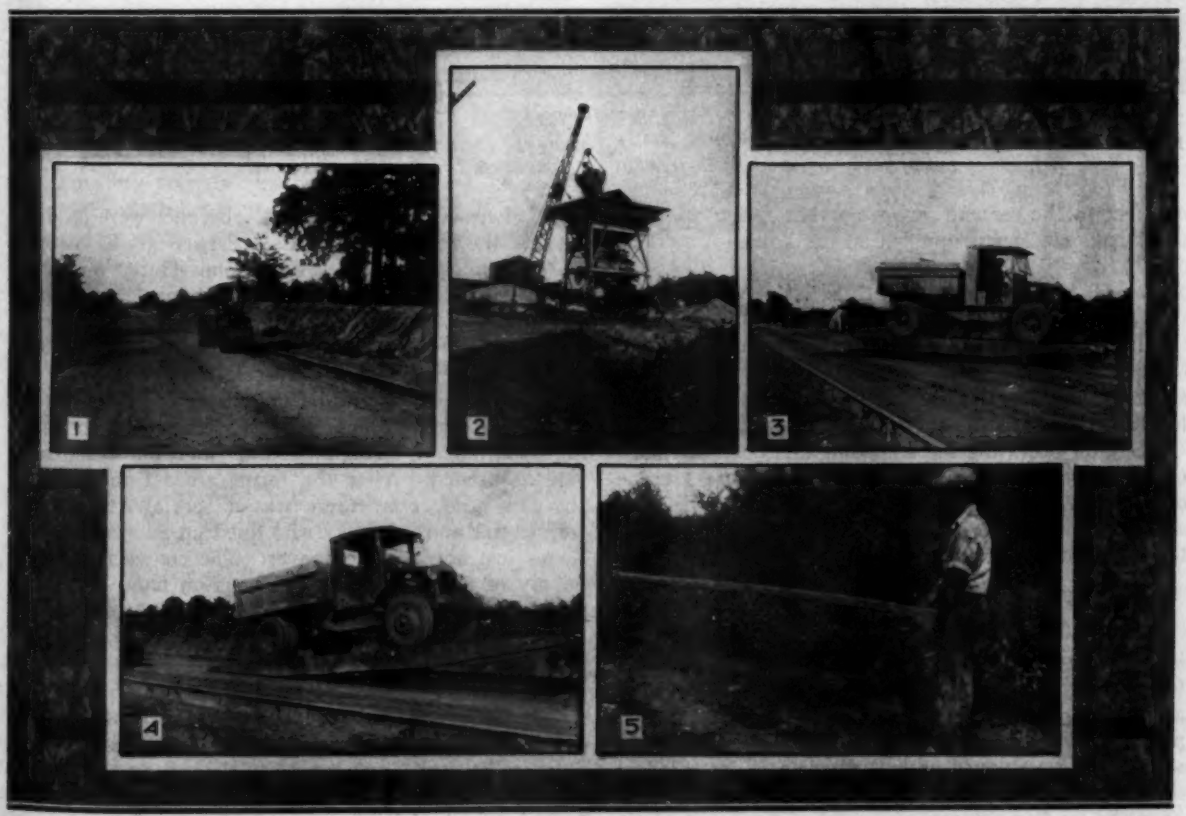
Lawrence Construction Co., Jackson, Miss. Well Equipped to Handle 16.5-Mile Concrete Road Job

DURING the 1929 construction season there was not much concrete paving undertaken in the state of Mississippi but a number of grading and drainage jobs were under way preparing for the more extensive program to be put under contract for 1930. Mississippi is only at the beginning of her hard surfaced road program compared to some of the northern states and is progressing cautiously to make every cent expended give the most in value. The 16.5-mile concrete road job from Raymond to Utica, Miss., was let to the Lawrence Construction Co., of Jackson, Miss., early in 1929. The contractor immediately set up an unloading and batching plant at Oakley about 4.5 miles south of Raymond and paved from Raymond to Oakley. Then the section from a point 5 miles south of Oakley to that town was paved and the unloading plant moved to a convenient siding in Utica and the remaining gap closed.

The Utica Batching Plant

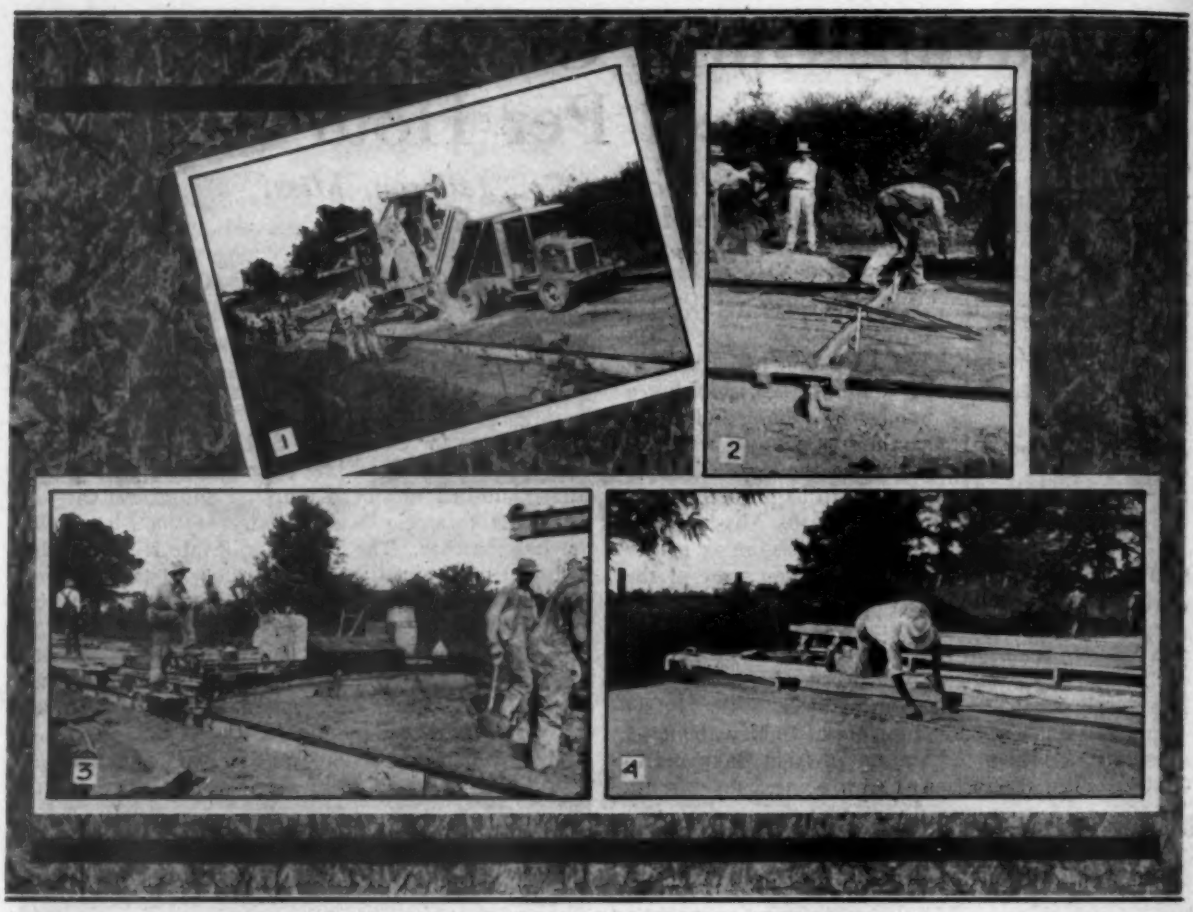
The set up for unloading and batching at Utica was standard, using a Koehring crane with ¾-yard Blaw-Knox clamshell to unload the sand and gravel cars on the siding to stockpile or directly to the Blaw-Knox weighing batcher. The Mississippi State Highway Department maintained a field laboratory at the batching plant and a designed batch was used throughout the job. On July 24, the proportions for a 7-bag batch were 1,927 pounds of gravel and 1,379 pounds of sand which was typical of the batches made up during most of the work although they varied slightly from car to car of gravel and sand.

The trucks backed under the batches and received their loads of sand and gravel and then drove about



MAKING READY FOR PAVING ON THE LAWRENCE JOB AT UTICA, MISS.

1. The well-prepared subgrade showing the Austin Pup rolling close to the forms. 2. The unloading and batching plant consisting of a Koehring crane and a Blaw-Knox batcher. 3. The turn table was well balanced and the man rode around on it after getting the swing under way. 4. Backing off the reversible turntable. 5. One section of the steel header board



PAVING AND FINISHING OPERATIONS UNDER WAY

1. *Two-batch truck delivering batch to the Rex 27-E paver.* 2. *Setting the Elastite expansion joint.* 3. *Ord finisher showing the roll of fairly dry concrete in front of the screed.* 4. *Hand-finishing the joint*

300 feet to the cement car on another siding and had the 7 bags of cement dumped on the batches. A total of 19 trucks were used under a subcontract, all but 4 of them being 2-batch trucks. Inability of the subcontractor to get enough trucks to supply the paver on the long hauls cut down the production considerably but both contractors cooperated to make the best of the situation and to increase the hauling fleet from every local source available.

The crew operating the unloading and batching plant consisted of: 2 men in the cars to clean up; 1 crane operator; 1 man on the batcher; 1 man on the sack shaker and baler; 3 men in the cement car unloading the bags to the trucks; and a foreman in charge.

FINE GRADE AND FORM SETTING

Mississippi is one of the states that believes in grading and putting in the drainage structures the year before paving is undertaken. This policy is conservative and will operate to give better roads over a longer period of time than the hurry-up policy of many of the states who have paved with hard surfaces for a longer time. In this case the same contractor happened to have the grading contract the previous year as had the concrete paving contract. The rough grade was about 4 inches lower than the final grade for the concrete slab.

A Lakewood graderooter and subgrader were used to prepare the road for paving. A Russell grader with a 10-foot blade hauled by a Caterpillar Thirty was used to shape the surface after the scarifying. An Austin Pup roller was used for compacting the subgrade ahead of the paver.

A gang of about 14 men under a foreman worked on the setting of forms and on fine grading. Three teams were used with fresnos to remove excess earth from the subgrade, to bring up forms and for other service as needed. After the forms are set roughly by the fine grade crew there was a special detail of 1 form-setter and 2 helpers who lined up and graded the forms just ahead of the paver. The contractor had a supply of 8-inch Blaw-Knox forms on hand and used them on this 9-6-9-inch job with 1-inch dressed lumber bolted to the base.

DOUBLE-DUTY FOR MOST LABORERS

The Lawrence Construction Co., has shown a faculty to keep each man busy without over-working him. Practically every man on the job had two or more duties which do not interfere with each other. This will be noted in the following paragraphs describing the operating organization on the road.

As the trucks came up the subgrade they were turned on a Freeman turntable which has the advantage of

being double-ended so that when a truck is turned around it is not necessary for the operator to turn the table back again. Further if for any reason the truck must be taken out of the way at once it can drive ahead and get out of the way. The turntable was spotted ahead of the paver twice a day by a tractor. It is very heavy and not easily moved by a truck. The turntable tips as the truck mounts it and then as it moves forward after being turned the turntable tips in the direction of motion of the truck permitting the truck to get away without delay. One man was used to operate the turntable.

About half way from the turntable to the paver 2 men waited on a small portable platform to empty the 7 bags of cement on each batch. Behind them and close to the paver 1 man was used to sprinkle the subgrade. This man also filled in spreading burlap and greased the paver. The man who worked on the grader scraped off the tops of the forms, oiled them and oiled the dowels and cap for setting the expansion joint.

One man was used to dump the 2-batch trucks at the skip of the 27-E Rex paver in cooperation with the paver operator. Attached to the paver was a Koehring subgrade planer with 1 man to watch it and see that the earth was removed. Then 2 other men, 1 on each side, removed earth from the forms and also set the side rods 3 inches in from the forms and 3 inches from the top of the slab. Two men were used to set the Truscon center steel and the headers for the expansion joints every 50 feet. A special header board of steel plate was used with prongs at either side of the positions for the 8 dowels between slabs. This header board is about ½-inch thick and rather heavy for 2 men to handle. The ½-inch Elastite expansion joint was set with the header board and a cap with equal-length legs.

Three puddlers were used but their work was divided, the center man shoveling only and the 2 side men shoveling and also spading at the forms. A Hug scratch template was used attached to the Koehring planer. One operator had charge of the Ord finishing machine, and then 3 men were used in the hand finishing operations. These men worked the 10-foot longitudinal float from a 12-foot-span home-made double bridge on wheels running on the forms, did the hand belting, edging and tested the pavement with the straight-edge. One man was detailed to do the hand finishing of the expansion joints from a single portable bridge. A Lakewood hand-operated finishing machine was kept on the job and used by one of the 3 men on finishing when the weather was cool and the concrete did not set up too rapidly. Otherwise the 2-man hand belt was used.

CURING

As soon as the concrete had set sufficiently to permit it burlap in strips 3 feet wide by 18 feet long was spread over the surface and wet during the remainder of the day. On the following morning the burlap was removed, the surface wet again and then covered with an application of Grasselli silicate of soda. The burlap was carried on a bridge and spread by 2 men who also attended to the removal of the burlap in the morning and the silicate treatment.

WATER SUPPLY

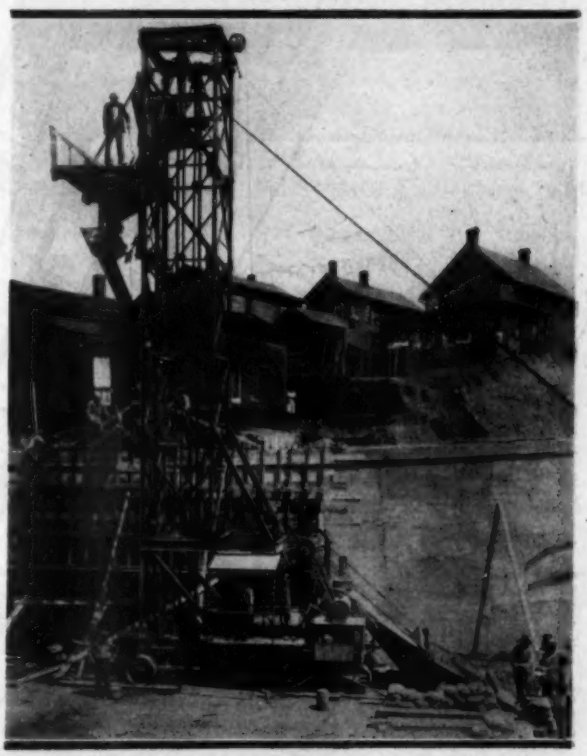
Water for the job was secured from ponds and creeks along the right of way. Two Domestic pumps with LeRoi engines were used with 2-inch pipe and taps set 225 and 250 feet apart. About 225 feet of hose was used on the paver.

PERSONNEL

J. Lawrence was Superintendent for the Lawrence Construction Co., in charge of the work. S. B. Lawrence is President of the company. S. D. Case was Resident Engineer for the State Highway Department.

Long Railroad Retaining Wall Poured With Paver and 52-Foot Tower

ON the job of constructing a new railroad retaining wall at Youngstown, Ohio, H. E. Culbertson Co., of Cleveland, the contractors were confronted with a big problem of how to place the concrete. There was very little space in which to work with no place to store materials and the job had to be completed in minimum time. The contract called for a steel reinforced concrete wall 1,400 feet long and 35 feet high, tapering up at the back so that the width at the base would be 15 feet 3 inches and the width at the top 2 feet 6 inches.

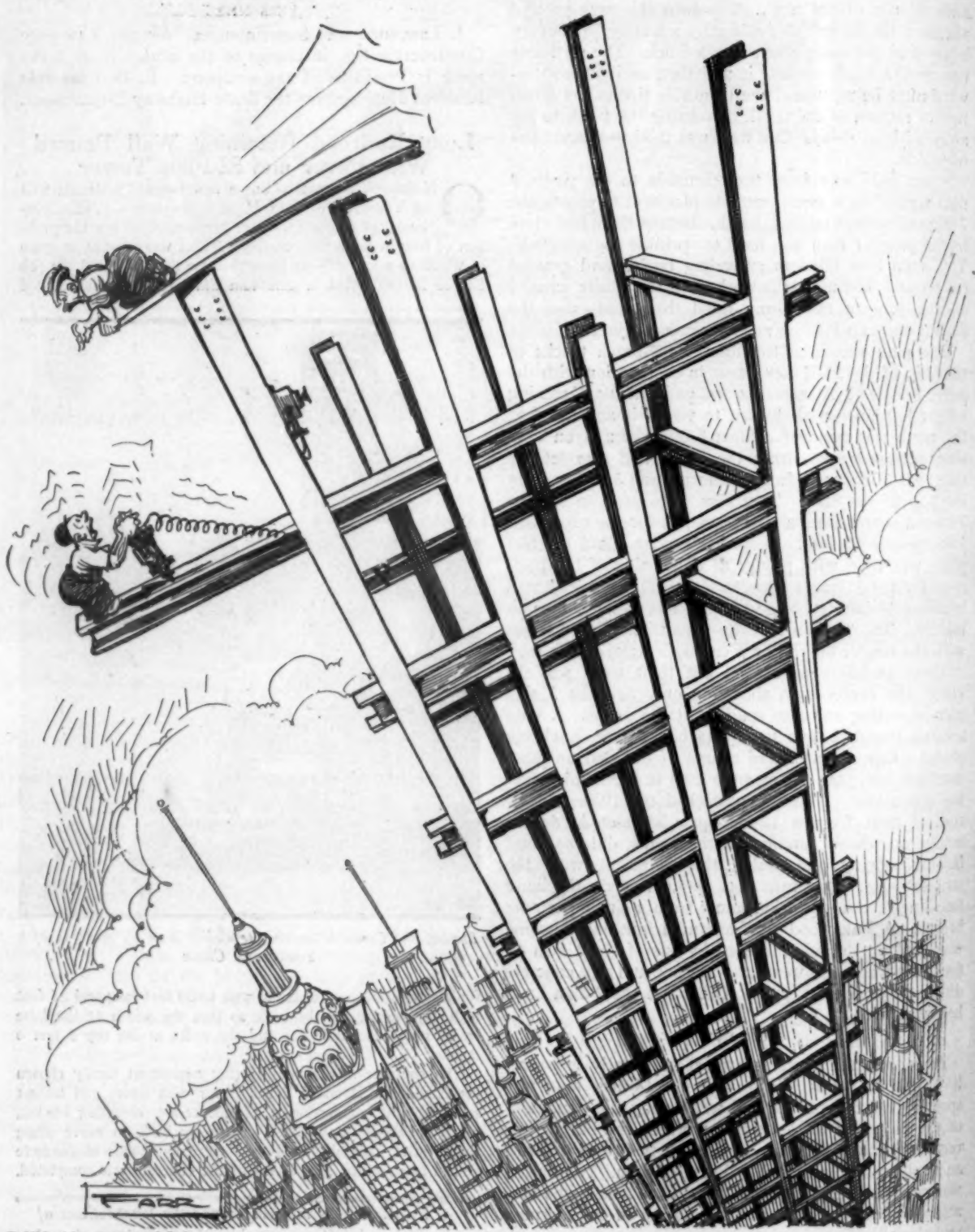


Placing the Concrete on the Retaining Wall by the Use of a Tower and Chute

The concrete mixing and placing equipment finally chosen consisted of a standard Smith paver with boom and bucket removed, and supporting a 52-foot tower, elevating bucket, receiving hopper and chute, compactly built to move along the forms. The job called for 7,000 cubic yards of concrete and in two months the placing of the concrete was completed.

"He who every morning plans the transactions of the day and follows out that plan, carries a thread that will guide him through the labyrinth of the most busy life."—VICTOR HUGO.

Far from the Madding Crowd



Published by courtesy of Judge

"Hear that rumblin' noise, Joe?—'phone down and see if it's the quittin' whistle, willya?"

A Month Saved Means Thousands Earned—Organization Does It

By H. J. Hassler

Assistant Chief Engineer, The H. K. Ferguson Co., Cleveland, Ohio

IN a country where big things happen quickly, many of them of signal importance to industry are apt to pass unnoticed, but occasionally a new landmark arises that compels attention, either because of its great size or of its unusually dramatic setting.

Early in September, 1928, the officials of the great Dutch Enka Corp., decided upon Asheville, N. C., as the home for their new plant, after investigating fifty-two possible sites. The H. K. Ferguson Co., was selected to design and build the structures and Lockwood Green, Inc., were chosen as consulting engineers on plant layout and equipment.

Construction Started Immediately

On September 23, 1928, the contract was signed and word was given to go ahead, although not a drawing had been made. Engineering work started the same day. The next day saw the Ferguson construction men at the site. On October 1 ground was broken. From that day forward every portion of engineering and construction proceeded under a single directing head, who contacted with the owner's engineers and directed the construction organization. The work was handled so successfully that in 9 months from the date of the contract, rayon was being produced in the new building.

The Site of the Enka Plant at Asheville, N. C., Just Before Construction Began October 1, 1928

In eleven months the work was finished at a substantial saving.

The Site

Just before the contract was let the executives of Enka had purchased approximately 1,500 acres in Hominy Creek Valley about 6 miles west of Asheville, 75 acres of which were to be occupied by the plant and grounds.

A preliminary survey showed that in order to provide suitable space for the plant, it would be necessary to move Hominy Creek for over a mile of its length and raise the level of the whole site about 4 feet. A battery

An Active Scene of Dirt Moving by Shovel and Hydraulic Giant in Building the Dam to Impound 500,000,000 Gallons of Water

Steam Shovels Working on Two Levels on 50-Foot Cut for Fill

of steam shovels was set to the task and immediately a new 100-foot stream bed was dug. Meantime borings were taken to ascertain the nature of the soil for foundations. After thorough tests it was found necessary to use piles under all the buildings and machine foundations. Immediately the work of driving over 3,900 piles was begun.

Fifty-foot cuts with the shovels working in benches cut away the hills to produce the 500,000 cubic yards of earth needed to fill in the low spots.

ARRIVAL OF MATERIAL CAREFULLY PLANNED

The layout of the plant called for a group of buildings in the form of a hollow rectangle, 1,500 feet on one side and 1,100 feet on the other, around which material in process were to progress in an unbroken line.

The driving of piles and foundation work began at the point where raw materials were to be received, and work was planned to proceed in the direction of the flow of production so that each unit should be ready for use in natural sequence.

Steel for the first unit was being erected before the foundations for the second were complete. Brick work and roofing followed along each successive unit without interruption. The floors and interior work progressed in the same sequence.

Before the foundations for the last units were complete, the first building, a three-story and basement structure of heavy steel and concrete construction, was ready for occupancy.

The plans for the entire operation meanwhile had been proceeding in the same order, being issued to the field organization as needed.

The construction required 12 steam shovels, a steady stream of teams and trucks, pile drivers at work at a dozen points, over 1,200 men working on the job, armies of laborers at mixers and with wheelbarrows pouring concrete into waiting forms, 7,000 tons of steel arriving in solid trainloads, 3,000,000 feet of lumber being delivered from a dozen Southern mills, and every other component of a modern manufacturing building coming in at the right time for use.

WATER SUPPLY CREATED

Considerable work was added to the original contract. A large filter plant was decided upon after the construction of the plant proper was well under way. Plans were begun at once and materials were ordered and erected. A dam was needed to impound the supply of one-half billion gallons of water for process use. Work was started at once, with Charles E. Waddell, of Asheville, as consulting engineer. The completed dam

A Universal-35 Shovel Digging a Section of the New One-Mile Bed for Hominy Creek

created an attractive lake around whose shores are the new homes of the executives of the manufacturing company who have come from Holland to live in Asheville. A bathing beach and picnic grounds for employees are provided at one end of the lake.

FEATURES OF BUILDING CONSTRUCTION

Throughout the job the greatest care was taken to

The Completed Plant in Production August 19, 1929

insure high-grade quality in every detail of design and construction. The roof is mainly of saw-tooth type with fixed skylight windows. The roofing of white top asbestos aids the daylight illumination of the building by reflecting light through the glass. It was interesting to note the marked increase in the light in the building as the installation of the white top roofing progressed.

The sash is of aluminum in the portions of the plant where corrosive fumes are present. Double glazing is employed where artificial humidity is employed. Cork roof insulation is used to prevent condensation.

Various types of flooring were adopted according to the usage to which they will be subjected. In rest rooms and cafeterias a special magnesite composition floor, developed in Switzerland, provides a resilient surface that is waterproof and silent.

SAVINGS EFFECTED

The fact that 6 to 9 months of engineering time was saved means that an investment of $10,000,000 is producing returns that much sooner. Rapid progress on the actual field work was possible not because of forced schedules but because of adequate preplanning and the closest of cooperation at every stage of the undertaking.

Simple Construction Plant for Small Dam

Side Hill Concreting Plant and Railway Trestle Facilitate Placing of Concrete on Farm River Dam

IN the village of Northford, town of North Branford, Conn., C. W. Blakeslee & Sons, Inc., contractors, are building a small diversion dam for the New Haven Water Co., to turn a small stream into the impounding reservoirs which the company has been constructing over a period of years. The dimensions and quantities involved are small but the ingenuity used in making the plant as complete and easily operated as possible, is great. The total volume of concrete involved is about 1,000 yards, the dam is 250 feet long, 17 feet high and has a spillway 100 feet long.

EXCAVATION

The excavation for the foundation in the wide open valley was handled by a P & H excavator. As an example of the type of flow to be expected in the valley, the excavator was left in the small stream bed one Sunday night last August and a heavy rain fell before morning. When the workmen arrived the stream was flowing level with the tops of the crawlers of the shovel while normally the flow would be but a foot deep.

The dam rests on a rock bed with a cut-off wall at each end carried well into a hardpan strata. Great strength was not a need of this structure which will only divert the heavy flows of the stream for storage elsewhere. The excavation was kept unwatered during concreting and during the final work of the excavator by a Cameron 6-inch steam pump.

CONCRETE PLANT

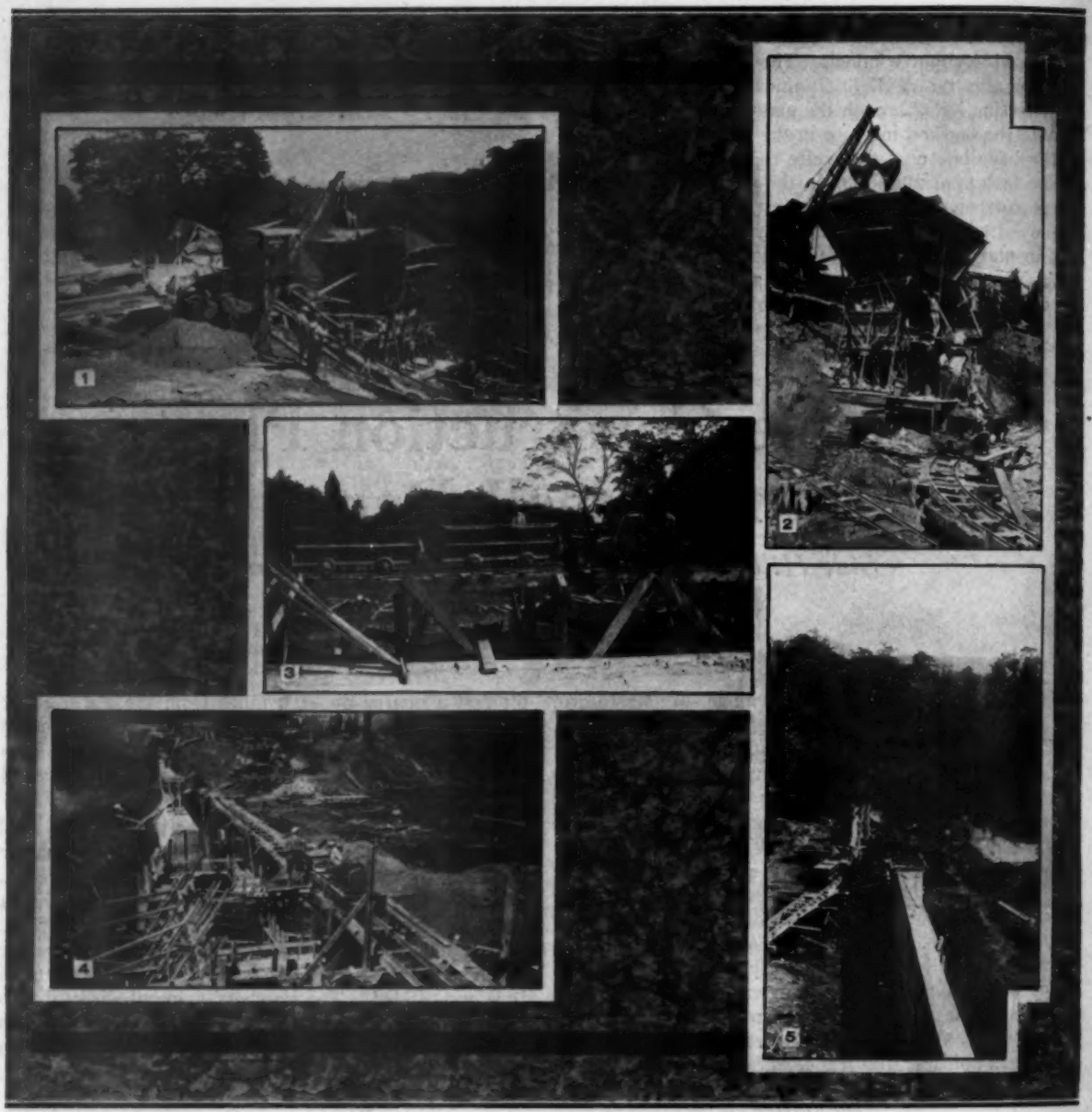
Sand and stone were delivered by truck from a sand pit and a quarry about 6 miles from the Farm River Dam. The trucks dumped over a ramp into storage pits at the top of the hill. The aggregates were handled from the pits to the Johnson bins by a Universal crane with ½-yard bucket.

Cement was delivered by truck and stored in a shed at the top of the hill and moved down to the mixer platform by one man with a hand truck as needed. The run to the mixer was about 25 feet and at a slight down grade so that there was no load to push.

The bins were equipped with Johnson measuring batchers for the 1 : 2½ : 4½ mix to which 4 per cent of lime was added. The batchers emptied directly into the Ransome mixer which was run on a 4-bag batch as that was the capacity of the Atlas dump cars which carried the batches to the forms.

POURING THE CONCRETE

Trains of two Atlas cars hauled by a Brookville locomotive were used to take the concrete from the mixer to the forms. A wood trestle had been built across the entire valley just upstream of the dam and on top of this an industrial track was laid with a switch running to the mixing plant. As the dam was completed at the westerly end the track was removed. The train was run out on the trestle and the two cars dumped into a wood chute leading to the forms. When work was started on the walls of the spillway one of the cars was switched to the west end of the straight track and the concrete shoveled into a chute for a small foundation. This was slow work but easier than any other method that could be economically developed. This continued only until the foundation was complete and involved only the switching of a car on every fifth trip.



PLANT LAYOUT ON THE FARM RIVER DAM, NORTHFORD, CONN.

1. Top of the ravine where aggregates and cement were delivered. Sand and stone storage in right foreground, cement shed at left of Universal crane delivering stone to the Johnson batching plant. 2. The concrete plant from below, showing the Ransome mixer loading one of the Atlas dump cars. 3. The concrete train of two Atlas cars and a Brookville locomotive on the trestle upstream of the dam. 4. Looking across the valley toward the cooncrete plant, car dumping concrete into wooden chute in forms. 5. View from top of hill at batcher plant looking across the valley

OTHER PLANT

A horizontal steam boiler was set up on the top of the west bank to supply steam for the Cameron pump and for a small pump located upstream of the dam. This latter pump supplied a tank mounted on the bank above the boiler and from that the water was tipped to the boiler and to the concrete mixer.

The stream bed above the dam site was flat and good meadow land. This area was used to advantage by the contractor for assembling the forms for the dam and for other carpenter work.

The trestle from the concrete plant to the dam was built on a 2 per cent grade, making it possible to use a light weight Fordson-Brookville locomotive. It could easily handle the two loaded cars on this grade.

PERSONNEL

The Farm River Dam was built for the New Haven Water Co., by C. W. Blakeslee & Sons, Inc., of New Haven, Conn. William H. Ryan was General Superintendent for the contractor, S. P. Sears in immediate charge of this job, and Clarence M. Blair, Engineer in charge of construction for Albert B. Hill, Consulting Engineer for the Water Co.

Belt Conveyors Hustle Mountain to the Ocean

By W. E. Philips

Engineer, Link-Belt Co., Chicago, Ill.

THE years 1906, 1907, 1909 and 1929 have marked successive steps in the progressive removal of hills which have stifled the progress of the building of the business district of Seattle. In 1906, the first project of regrading which consisted of the leveling and removal of approximately 5,400,000 cubic yards of earth, was started. The area affected comprised 43 city blocks. An industrial railway was used to handle the material. In the same year another project was started known as the West Lake Fill in which the same methods were used. In 1907 a project at Third Avenue and Spring Street was undertaken, also using industrial equipment.

In 1909 what is known as the old Denny Regrade or Denny Regrade No. 1 was started, using hydraulic sluicing to move the material. The water from Elliott Bay was pumped at the rate of 3,500 gallons a minute against a pressure of 180 pounds and from Lake Union it was pumped at the rate of 12,000 gallons per minute under the same pressure head. This tremendous volume of water was played upon banks of earth by nozzles having diameters of 3 and 3½ inches. The water and earth were delivered to large pipes and the debris was sluiced in a big tunnel down Bell Street, emptying into flumes carrying mud and water out into the bay for disposal. In addition to this, steam shovels were used, delivering their material into industrial cars which in turn dumped into the tunnel where hydraulic jacks

One of the 200-Foot Portable Conveyors at the Fifth Street Level Delivering Earth to the Hopper Over the End of the 943-Foot Section of Line Conveyor

Structure Supporting the Line Conveyors on Battery Street, Clearing All Obstructions and Not Interfering with Business of Traffic

One of the Huge Self-Dumping Scows Discharging Its Load by Overturning Which Presents Another Deck for the Next Load

broke up the debris, all of which was delivered to the bay for fill.

POWER SHOVEL AND CONVEYORS MOVE ALL DIRT

The present regrade project involves moving about 5,000,000 cubic yards of earth from Denny Hill to Elliott Bay and is known as the Denny Hill Regrade Project No. 2. An entirely new method was determined upon for handling the material in the present project. In order to eliminate wear and tear on the city streets and interference with traffic and to do away with the noise and annoyance formerly caused to residents and business houses along which the material was handled, it was decided to use conveyors entirely.

The contract for removal was awarded to George Nelson & Co., who are allowed 300 working days to move the 5,000,000 cubic yards of dirt. An electric crawler shovel with a 2-yard bucket loads material from the hill into a hopper which feeds onto a 36-inch wide movable Link-Belt conveyor, 200 feet long. This delivers to other conveyor sections which are 1,360 feet, 920 feet and 600 feet long, and which finally deliver the material to scows on Elliott Bay or to railroad cars or trucks which transport it elsewhere for fill.

The cut is being made in two benches with two shovels operating on the top bench, making a cut 40 feet deep. Two other shovels operate on the lower level which is on the grade line. The field belts 36 inches wide operate at a rate of 400 feet per minute, while the main conveyor sections are run at 500 feet per minute and have a capacity of more than 600 cubic yards per hour. When the work is completed, the field or portable conveyors which feed to the main line conveyor will have turned through an angle of 180 degrees, so that they will actually be running in the opposite direction from which they started.

CONVEYOR SYSTEM RUNS OVERHEAD THROUGH MAIN STREET

The belt conveyor system runs overhead as shown in the illustration, clearing street car trolley wires without interfering with traffic or with business for a half mile, crossing over the Railroad Avenue railroad tracks to the shoreline. A long straight line of overhead conveyor discharges onto the pier conveyor which runs at

(*Continued on page 83*)

An Airplane View of the Denny Hill Regrade Project No. 2 Showing Two Field Conveyors and the String of Line Conveyors Leading to the Pier Conveyor Which Leads at an Angle to the Scows. Much of the Lower Right-Hand Section of the Area Shown Will Be Ultimately Included in the Regrading

The Kid Scouts New Business

By M. H. Whitcomb

THE last time I had seen Michael O'Brien,—"General Contractor—Alterations a Specialty"—he had been in the throes of firing one clerk and hiring another to replace him.

When, therefore, I stepped off the train at Springfield, in the course of my quarterly sales trip, it was with a sense of anticipation that I walked the two short blocks to Mr. O'Brien's establishment.

I found Mike standing outside, thumbs in vest pockets, watching a sign painter affixing an "& Co." to the "Michael O'Brien" on the sign over the door.

"So the baby was a boy," said I. "Congratulations!"

"Guess again," said Mike. "I'm a bachelor."

"Suppose you tell me—and introduce me, too," I replied.

"Sure. Come on in, take a load off your feet, and I'll tell you the story. I may even buy something from you, who knows."

Inside I got another surprise. Mike's office had been considerably modernized. However, I saw that he was bursting to tell his story so I interrupted not but followed him into his private office.

Once settled in a comfortable chair with a good cigar (mine) tilted at the right angle, Mike began his tale.

"Remember the clerk I was in the act of hiring the last time you wandered in here?" he asked. "Well, he's the '& Co.'

"Hadn't been in here two days before he began to make suggestions about changes. Some of 'em were good, some not so good—but the point is he was interested enough to make 'em.

"He's the one who changed the office around and made it look like something. Installed a cost-accounting system, too, that saves money and scads of time. Oh, he's alive all right, always changing something or other.

" 'Long about the third week he'd changed everything in sight and was beginning to look for new fields to conquer. Came to me and suggested that we do more advertising. Well, I'm a local contractor only, not equipped to work very far out of this city, and as far as local advertising went, I convinced him that we were doing enough of that along the usual lines.

"He wasn't satisfied, though, and he insisted that there was a lot of profitable work we should be getting and weren't.

"One day he came to me with a piece from a local paper announcing that a certain firm's lease was to expire about a month from that date and that the firm had leased new quarters in another location; etc. The usual stuff.

"I didn't see anything wildly exciting in the clipping but Ben looked at it different.

" 'Don't you see, sir?' he said. 'Here are two good prospects for remodeling jobs. First, the old fashioned building about to be vacated should now be modernized in order to rent more easily and, secondly, the firm that's moving may have a remodeling job to do in their new quarters.'

"The upshot was that the kid wanted permission to go out and see what he could do about it. I couldn't see any harm in it—and I certainly could use some extra business—so I let him do it.

"And I'll be danged," continued Mike, "if the kid didn't come back with one of the jobs practically sewed up. Of course, he wasn't up to giving estimates and that sort of stuff but he'd sold the owner on the idea of remodeling. After that there was no stopping him—and I wouldn't have wanted to.

"He got after me to give him as many pointers as possible on the estimating and technical end of the game. Even took a couple of courses at the local 'Y'," chuckled Mike.

"And then, one day, he walks in here towing behind him a certain Rogers, fellow who owns a whole street full of commercial property that's just crying for modernization.

"He introduces Rogers to us and says that, being as one of Roger's biggest tenants is about to move, Mr. Rogers is convinced that now would be the logical time for him to remodel his property, and would I please talk details to him.

"Now I, and every other contractor in town, had talked to Rogers about modernizing his stuff and been put off with the old, but good, excuse that his tenants were on lease and that he couldn't or wouldn't disturb 'em.

"Here the kid had nicked him at just the right time, and I was achin' to know how he'd done it.

" 'Easy,' says he, when I asked him. 'I've been down to the local registry of deeds looking up the expiration dates of leases on property that's ripe for remodeling. That's how I happened to catch Rogers in the nick of time, and that's how I'm going to catch several others I've got in mind.'

"Well, that set me to thinking about the handwriting on the wall. That kid was too clever to lose—especially to a competitor—so I made him a proposition: a small investment on his part, the rest to be brought in in form of contracts, and a partnership for him.

"And that," said Mike, "is the reason for the '& Co.' being added to the sign.

"And now bring out your book and pencil and we'll see what we need in the way of new equipment to handle those jobs we've been getting."

"In my wide association in life, meeting with many and great men in various parts of the world, I have yet to find the man, however great or exalted his station, who did not do better work and put forth greater effort under a spirit of approval than he would do under a spirit of criticism."

—CHARLES M. SCHWAB.

Grading a 480-Acre Airport with Elevating Graders

Work Includes Moving of Seven Sets of Farm Buildings and Services of a Gigantic Fleet of Grading Equipment

GLEN VIEW, ILL., a suburb of Chicago is the site for the new Curtiss Airport Corp. airport which will be used by the Curtiss Flying Service of Illinois. The owners purchased 480 acres of property for the airport and it has been necessary to move seven sets of farm buildings from the property as a part of the preparation for its new use.

The field is being graded accurately with a fall of 0.3 foot per 100 feet. The plans call for the stripping of the black dirt or overburden, the grading of the clay after which the black dirt is redistributed over the clay in order that the whole field may be seeded. The excavation of 650,000 cubic yards of black dirt and clay has been necessary to bring the grade to specifications.

The Lovgren Construction Co., of Highland Park, Ill., of which M. R. Lovgren is President, had the contract for the entire grading job which is being handled exclusively by elevating graders, using seven Austins, one Western and one Stroud machine. The work started about June 1 and will soon be completed.

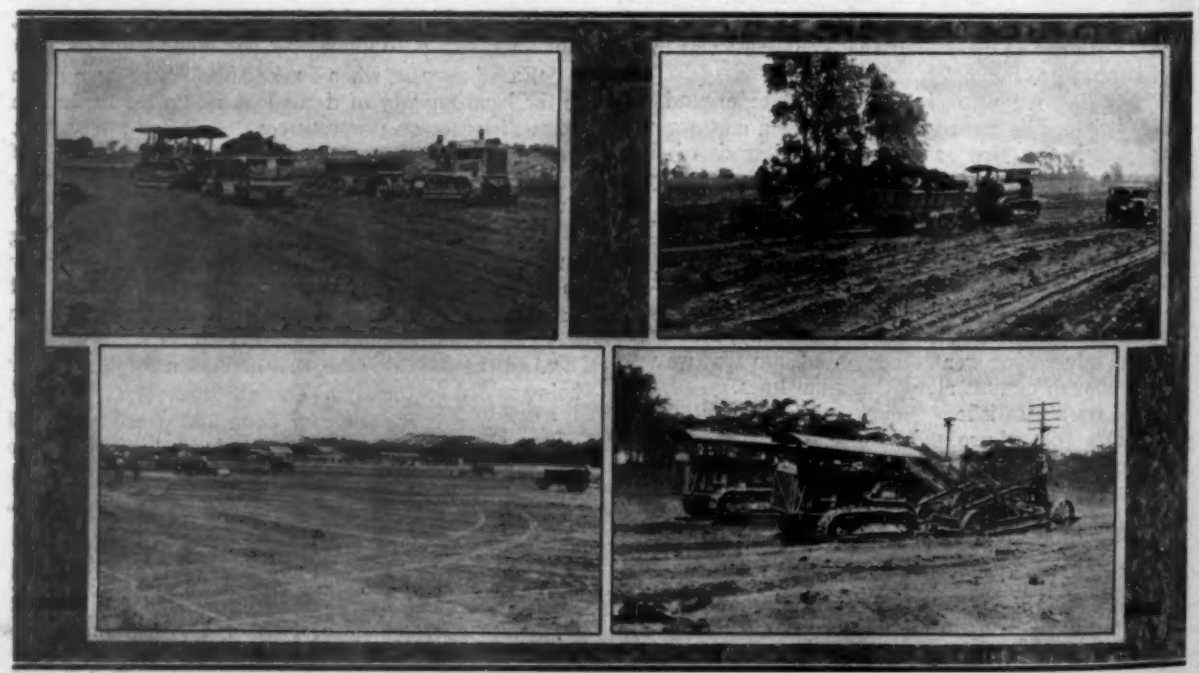
The hauling equipment comprises 28 Caterpillar tractors, 10 Western crawler wagons, 5 Streich crawler small tractors, 3 concrete mixers, 8 blade graders, 3 wagons and about 320 head of stock on 1½-yard dump wagons. The grading is being handled by the Lovgren Construction Co., W. J. Sheppard of Chicago, Burch Construction Co., Madison, Wis., I. D. Lain of Park Ridge, Ill., and H. H. Enbody of Aurora, Ill.

Mr. Sheppard, who has one of the largest elevating grader outfits in the district is operating 3 Austin elevating graders; Mr. Lovgren, two Austins; the Burch Construction Co., 2 Austins; I. D. Lain, a Western and H. H. Enbody, a Stroud. One of Mr. Sheppard's graders which is fitted with a power take-off is loading consistently 1,500 cubic yards per day into 7-yard Western crawler wagons.

Other equipment being used on the job includes 14 rollers, 9 rotary fresnoes, 4 bulldozers, 6 trenching machines, 3 Bear Cats and 14 supply trucks, Mr. Lovgren alone has over 500 men on his payroll.

Drainage

Proper drainage of airports is a most important consideration and Curtiss field is to be thoroughly drained by over 80 miles of tile which involves a large expenditure but insures the best of conditions for landing and taking off at all times of the year. The six trenching machines are working to dig the trench for the drainage tile.



Views of the Construction of Hangars and Grading of the New Curtiss Airport at Glen View Near Chicago, Ill.

HANGAR

The hangar is to be of steel and brick construction, 584 feet long and 128 feet wide. The plans call for three additional hangar units to be added later. The warming up aprons are to be 5¼-inch concrete with a ¾-inch white sand and cement top hand troweled and finished. The aprons and runways will contain about 18,000 square yards of concrete and the hangar floors will bring the total to about 33,000 square yards.

PERSONNEL

The personnel of the Lovgren Construction Co., Highland Park, Ill., general contractors for this job include G. Kirkendall, General Superintendent; John Maloney, Superintendent of Earth Moving; M. Douthitt, Superintendent of Building Construction; George L. Beck, Superintendent of Concrete; Charles Swanberg, Superintendent of Drainage. For the Curtiss Airport Corp., Jack Tuylse is Chief Engineer in an advisory capacity and L. K. Slepow is Engineer in Charge.

Belt Conveyors Hustle Mountain

(Continued from page 80)

which flows into the tunnel directly from the steel mill is always an angle out to the end of the pier where the stream of moved out into the bay to discharge their load in deep water.

These scows are reversible with two decks for alternate loading and an intermediate chamber for water or air. When the scow has been towed to the point where the load is to be dumped, inlet valves are opened permitting water to throw the scow out of balance and permit it to dump as it capsizes. After the water is pumped out the reversed deck is ready for a new load.

PERSONNEL

This work is being done by George Nelson & Co., Seattle, Wash. The work is under the direction of W. D. Barkhuff, City Engineer of Seattle.

Pumping Buckshot Through 10,000 Feet of Pipe

Diesel-Powered Dredge Pumps 300,000 Yards a Month of Silt and Clay at Rosedale, Mississippi to Fill River Side Borrow Pits

FOUR diesel engines make up the power plant of the dredge "Diesel" which is working near Rosedale, Miss., filling the river side borrow pits of the new enlargement levees. The steel hull of the dredge is 175 feet long, with a 40-foot beam, 9-foot hull and draft of 7 feet.

POWER PLANT

All four of the engines were built by McIntosh-Seymour. The main engine is a 6-cylinder unit of 1,150 horsepower and is used to operate the pump. The next largest engine is a 4-cylinder unit of 240 horsepower and is used to turn the cutter. The third engine is a 3-cylinder machine direct connected to a 25-volt generator supplying electricity to operate the 150-horsepower motor of the winding gear. The fourth engine is a 2-cylinder machine of 110-horsepower which runs most of the auxiliaries.

CUTTER HEAD AND PUMP

The dredge is equipped with three sizes of cutters and the ring is about 5 feet 10 inches and the cutter blades 5 feet long. The suction pipe is 26 inches in diameter all the way to the pump which is 24 inches and has a 24-inch discharge. The impeller is 72 inches. The ladder is 74 feet long over all including the cutter. The engines are connected to the pump with an increasing gear speeding up the revolutions from 150 at the engine to 285 at the pump.

PONTOONS AND PIPE LINE

The first 500 feet of the pipe line are pontoons allowing the dredge to swing over a wide arc and secure a large volume of pay dirt before it is necessary to move the land line. The 24-inch steel pipe is butt welded and made specially for this work by the Kane Boiler Works, Galveston, Texas, in 50-foot lengths.

On the land line which is 16-foot lengths the first 500 feet which have to stand the highest pressure of this section of the line are held together with 1-inch steel cable looped about the pipe to prevent blowing apart. After this the cable is used only where there is a curve in the line making a weaker section where the line is more likely to part.

OPERATING ORGANIZATION

The dredge operates 24 hours a day on this 1,000,000-yard contract and as soon as this is completed the dredge will be moved to Mounds Landing about 40 miles south and another fill of equal size started. The bid prices for both these jobs was 26 cents per cubic yard in place. This is considerably less than the prices of fill by the mule-team method.

The dredge crew consists of the Captain and 30 men making up three complete crews for the 8-hour shifts. Another 15 men are used to shift pipe and for general work. With this comparatively small organization it is possible to place 500,000 cubic yards of earth per month when the pipe line is 5,000 feet or less in length. With longer lines the pumping is proportionately less. The largest month the dredge had was 292,000 yards.

PAYMENT FOR EARTH PLACED

The inspectors of the Corps of Engineers, U.S.A., cross-section the old borrow pits which are to be filled before the work starts and again as each section or station is filled. Payment is made on computed yardage, provided it is not more than 25 per cent greater than required yardage for enlargement. This 25 per cent is allowed for possible shrinkage and loss of material in rehandling. Any material more than the 25 per cent is not paid for.

PERSONNEL

This work is being done by the Orleans Dredging Co., a subsidiary of the United Dredging Co. of New York, Capt. R. A. Cole, Superintendent, and Capt. S. C. Ohlhausen, are in charge of the dredge for the company, E. S. Maupin, Area Engineer, Corps of Engineers, U.S.A., is in charge of the Northern Area, Vicksburg District, and Harry K. Doyle, Associate Engineer, with headquarters at Rosedale, Miss.

The Importance of Safety in Construction Work

IT is the duty of any employer to provide a safe place to work. It is, furthermore, decidedly profitable to see that such conditions exist. A job should be laid out having in mind that during the life of the work the men will travel hundreds of man-miles in the prosecution of their duties and carry many tons of material from place to place. Well-established routes safely constructed and well-maintained will pay good dividends. No man will deliver maximum output if part of his attention and energy is needed for self-preservation—make his scaffold safe, discard a much-used ladder for a stair, see that guards protect a man during a careless moment, clean up the trash that causes many circuitous routes, and menace thin-soled shoes with rusty nails. Accidents affect not only the unfortunate individual and his family who are also caused undue suffering and hardships, but demoralize their fellow workmen.

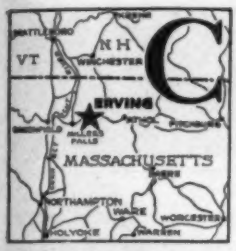
—From a report of the Committee on Construction Plant and Methods for Concrete Bridges, published in the *Proceedings*, Am. Soc. C. E., Vol. 55, No. 8.

FILLING BORROW PITS BY HYDRAULIC DREDGE

1. The dredge "Diesel" of the Orleans Dredging Co., which handled the heavy buckshot clay in quantities which earned a bonus almost every month for the crew. 2. A section of pontoon pipe used to connect the dredge with the shore line. 3. Rolling in a new section of pipe. This was pulled into position to connect with the line by a small powerful hand winch mounted at the last joint. 4. The dredge delivering a normal flow of silt and water. 5. The "load" arrives and proves difficult for the pipe crew to move from the end of the pipe so that the fill would be evenly distributed. The pebble-like material in the foreground is buckshot clay

Building 4.6 Miles of Penetration Macadam with Continuous Traffic

Fitchburg, Mass., Contractor Successfully Completes State Project at Erving, Mass., in 6 Months With Small Organization



COINCIDENT with the construction of the new penetration macadam pavement on the Mohawk Trail between North Adams and Charlemont, Mass., the state contracted for the resurfacing or salvaging of an old section of roadway through the town of Erving about 12 miles east of Greenfield, the eastern end of the famous Trail. Normal tourist traffic over this route is very heavy during the months when the modern nomads are wandering and with the completion of the reconstruction of the Trail an unusually heavy flow of traffic is to be expected. Anticipating this a contract was let to Ralph E. Bull, Fitchburg, Mass., for the salvaging of a section of Route 2 about 4.6 miles long between Turners Falls and Athol in the town of Erving.

The pavement was designed 24 feet wide outside of the towns but widened to meet the street widths of the communities through which it passed. The project was all resurfacing using the old road as a base except where the grade was lowered thus destroying the value of the compacted base. In these cases the grade was cut below final grade and 12 inches of gravel fill placed and rolled.

Grading

The necessary grading was handled by two Northwest gas shovels which ripped up the old pavement wherever needed without any difficulty. All the final grade was handled with a crew of about 60 men with hand shovels. The gravel for backfill was hauled in by trucks from local gravel pits and rolled with one or more of the four Buffalo-Springfield steam rollers which were used on the job for handling the compaction of fill and the aggregate.

Handling Aggregates

Both the No. 1 and No. 2 stone for the job was delivered by rail on a railroad siding at Erving at about the mid point of the job. The gondola cars dumped into a pit beneath the rails and a Barber-Greene conveyor loaded the trucks direct. A fleet of Mack and Larrabee trucks was hired by the contractor for this work. The job which was awarded on a bid of $212,000, which with extras ran to about $220,000, involved the hauling and placing of 23,500 tons of stone. At the unloading plant only two men were needed to handle all the stone, one man in the car and one man running the conveyor.

Placing Stone

The contract was awarded to Ralph E. Bull on April 30, 1929, and work started May 8. In the sections where grading was necessary the shovels went to work at once and soon the entire project was in shape for the spreading of the base course stone. In sections where the old base was within 2½ inches of the new grade the bottom course of 4½ inches of No. 1 stone with about 40 per cent of No. 2 stone added was omitted. This made possible the salvaging of the strong well-compacted roadway which had been used for many years by heavy motor traffic. In all other places the bottom course was laid and rolled to a firm condition before the top 2½ inches of No. 1 stone was applied.

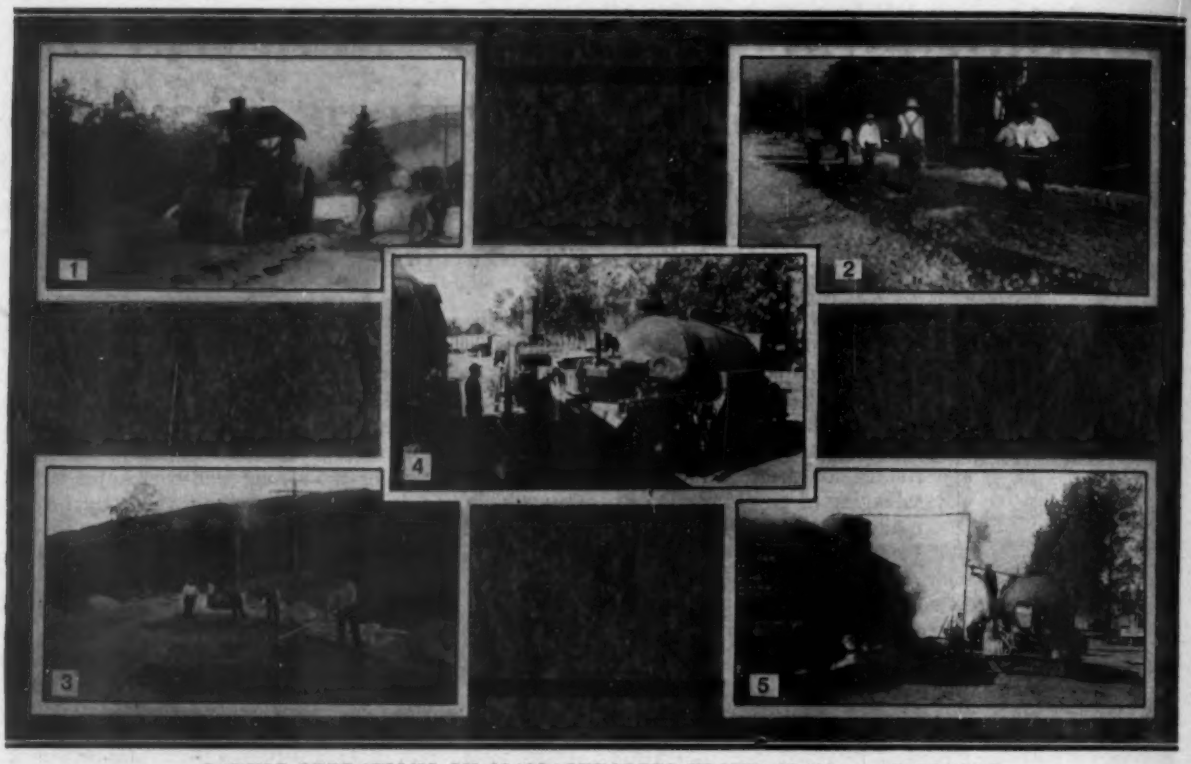
As soon as the first rolling of the bottom course was completed giving an even surface, sand was hand cast over the surface and rolling continued with the 12-ton steam rollers. The sand acts as a binder and also holds the asphalt penetration in the top course. The sand for the work was loaded from a pit near the middle of the job by hand and distributed along the shoulders before the aggregate was spread.

Earth shoulders were thrown up at the sides to hold the bottom course in place. As these would only hold the outer edge of a strip the bottom course was spread 14 feet wide to hold the top course during penetration. A stone spreader 8 feet wide was used at the start of the work but was not found successful because of the extra width that had to be taken care of by an extra depth of stone hand spread to the required width. It was found better to dump the stone from the trucks with the tail gate open to a predetermined angle and then do all the spreading by hand. Stone forks were used throughout.

Penetration

Socony asphalt was furnished by the Standard Oil Co. of New York from a plant set up at Millers Falls, 4 miles from the west end of the job. The asphalt was delivered at the heating plant in standard tank cars and heated with a water tube boiler hooked up to the cars. As the Socony and Etnyre trucks used for hauling and distributing the asphalt were equipped with heating apparatus of the Merrill and Etnyre types the asphalt was heated to the specified temperature and pumped to the distributor trucks.

The road was penetrated in two strips of 12 feet each with Binder C before September 1 and all asphalt used after that date to the final penetration permitted by Massachusetts specifications on October 15 was the softer Binder B. The top course was penetrated at the rate of 2¼ gallons per square yard and then covered lightly with ¾-inch stone to prevent the roller sticking to the asphalt. After the top course was rolled to a final set the road was allowed to stand for at least 24 hours before the seal coat was applied. This consisted of ½ gallon per square yard of the same binder used in the top course covered with pea stone and rolled. On steep



PAVING OPERATIONS ON MASSACHUSETTS HIGHWAY NO. 2 AT ERVING

1. A Buffalo-Springfield steam roller breaking up the old bituminous macadam pavement. 2. Hand casting sand from a local pit to bind the bottom course stone during rolling and to prevent the top course penetration from going too deep. 3. Brooming the sand during the last stage of rolling the bottom course. 4. An Etnyre truck at the heating plant showing the water tube boiler mounted on wheels in the center background. 5. Loading one of the Socony asphalt trucks at Millers' Falls

grades the seal coat was omitted to give better non-skid traction. A total of 173,000 gallons of asphalt was used on this job.

MISCELLANEOUS ITEMS

The contract called for the installation of 13,000 feet of pipe drains, 8,200 feet of cable guard rail, 2,700 feet of wooden guard rail, and the removal and resetting of 4,300 feet of wooden guard rail. This rail was set the previous year by the maintenance crews as a safety measure and was deemed in good enough condition to be reused on the reconstructed road.

The contract date for the completion of the roadway, shoulders and guard rails was October 26.

PERSONNEL

For the contractor, Ralph E. Bull, Fitchburg, Mass., Frank Mosher was Superintendent. H. C. Van Wagner was Resident Engineer for the Massachusetts Department of Public Works.

Concrete Plant for 38-Story Steel Frame Building

THE success of a contractor on steel building work depends largely upon the efficiency of his concrete and mortar plants. Removing rubbish and non-interference between various building operations are also important considerations. Building superintendents should make a thorough study of all stages of the work before any of it is actually begun.

The Committee on Construction Plant and Methods for Steel Frame Buildings of the American Society of Civil Engineers, as reported in the *Proceedings*, Vol. 55, No. 8, page 2042, gives some interesting data on the construction of a 38-story office building in Chicago, Ill., which was completed about five weeks after the wrecking of the old building began. While the site was on a corner, with a 12-foot alley along the third side, the materials could be received only from one street. The layout of the concrete plant under these conditions is interesting. Three driveways were built from the one street into the building in order to provide ample receiving space for all materials. Truckloads of sand and stone for concrete were backed into the building on one drive and dumped through a grating in the floor built of 3 x 12-inch planking set on edge at the rear of the drive. Below the grating in the basement a large hopper, divided into two compartments, one for sand and one for stone, was constructed. A 1-cubic-yard concrete mixer was placed on a firm foundation slightly lower than the bottom of the hopper, while the concrete hoisting buckets rested in the shaft at a point lower than the discharge of the mixer. This arrangement proved ideal for, by means of drum batchers at the base of the sand and stone hopper and a system of chutes, the sand and stone could be quickly transmitted from the hopper to the mixer and then to the bucket. Cement in bags was dropped through a chute from the drive above and stored close to the mixer, where one man could add the correct quantity to each batch. An average output of 40 cubic feet per hour was made with this plant.

Common and hollow brick were hoisted at night and were stored on the floor where they would be needed. Face brick were hoisted from the curb at short intervals during the noon hour, thus making the greatest possible use of the hoisting equipment.

Safety Methods Employed on New Chrysler Building

AN excellent example of safeguarding labor on a skyscraper in the course of erection is demonstrated daily on the Chrysler Building, New York, according to a recent report from the Committee on Accident Prevention of the Building Trades Employers' Association of New York. Upon its completion this will be the world's tallest building.

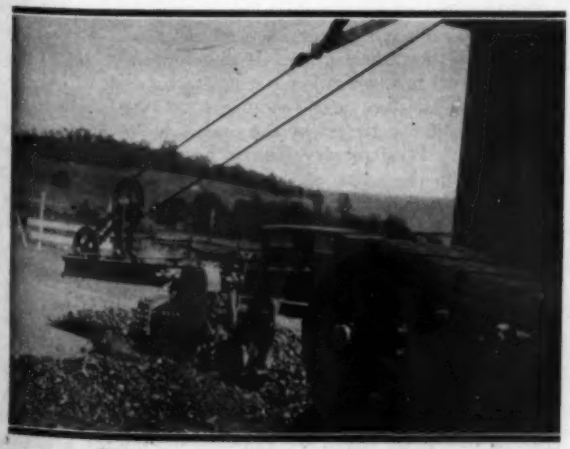
Every possible precaution has been taken on the Chrysler Building to safeguard the men from injury or death during the progress of operations. The material hoist shaftways have been guarded according to the best practices on all floors; temporary elevator doors were installed at all openings of the passenger elevators; fire extinguishers are in place at advantageous points throughout the superstructure; all openings in floors have been carefully guarded or boarded over; the interior scaffolding properly staged and persons passing underneath were protected from falling objects; debris is carefully piled out of the busy lanes of traffic; a telephone system communicating with all floors has been installed by means of which any of the general or the subcontractors' superintendents or foremen can be easily located; a new method of signaling for the material hoists was in operation at all floors and numerous innovations in the matter of equipment has been employed, with a view to reducing the possibilities of casualties.

The contractors for this building are Fred T. Ley & Co., Inc., Springfield, Mass.

Loosening Tar Bound Macadam With a Skimmer

ON a repaving job near Altoona, Pa., it was found necessary to loosen an old surface of tar bound macadam without removing it. The old surface was in fairly solid condition, but the road was to be covered with concrete pavement of standard specifications. The macadam had to be thoroughly broken up to an accurately determined depth and then rolled ready to receive the new surface of concrete.

The material was too solid to be broken up with a plow, and scarifiers would not penetrate uniformly and to the required depth. Revolving shovels with bank scoops or outward arc buckets were equally unsatisfactory in excavating exactly the stratum of old pavement which was to be reconstructed. So a 20-ton half-swing Keystone excavator with ⅝-yard skimmer bucket was used by the contractor, Samuel Domenick of Altoona, Pa. The flat bucket with 14 feet of horizontal travel on the boom lifted exactly the depth of material that had to be displaced, the material being thus loosened and loaded into the bucket was then dumped back on the road surface. By this method it was possible to break up through all of the old pavement.



A ⅝-Yard Skimmer Loosening Compacted Macadam

The Editor Comments

This Month's Cover

Did you notice this month's attractive cover?

Contractors as a rule are a very practical lot—with not much time to spend on enjoying the scenery! They're much more interested in seeing that the joints are tight on the water line that supplies the mixer, or that the asphalt plant produces a hot mix at just the right temperature and just the proper proportions.

But if you had been with me when I climbed down a steep embankment to find out the type of set-up used to supply water for the sand and gravel washing operations of the Arborio Construction Co., near Plymouth, N. H., in September, I'm sure you would have stopped, just as I did, to drink in the view of that meandering New England stream!

So, when I took a snapshot of the 3½-inch centrifugal set at the edge of the stream about 400 feet from the gravel pit, I managed to get some of the surrounding scenery into the picture, too.

Then I thought, "Guess I'll try enlarging this little snapshot. Perhaps it will make a good cover page for CONTRACTORS AND ENGINEERS MONTHLY."

And it *did!* Take a look at it now, and see if you don't agree.

For Asphalt Contractors

How many of our readers among the asphalt contractors noticed the descriptions of three particularly interesting asphalt jobs which appeared in the September issue of CONTRACTORS AND EGINEERS MONTHLY?

Perhaps you laid the copy aside, thinking you would have more time tc look it over later. Look up these three reports—two from Ontario and one from Michigan.

An Injured Foot and Pouring Rain

You should have been with me when I visited the Raynor Construction, Ltd., job between Bedell and Spencerville, Ontario.

There was a pouring rain and the Superintendent, T. B. Woodyatt, was in bed with an injured foot. His enthusiasm over the excellent plant that he had set up led him to get out of bed and travel around in the rain on crutches, in order to show me every part of the plant.

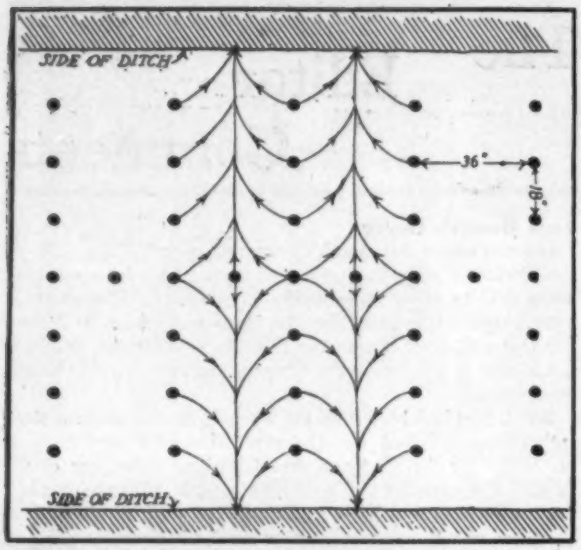
Then, when we were having coffee together at the end, he told me the interesting story of how he fought the snow to lay a hot-mix pavement last year near Dundas (which you will find in your October issue on page 71).

The fine spirit of cooperation which has been shown by the various superintendents on the jobs I have visited and written up this season has been a source of great gratification and an inspiration to me.

Your Suggestions Welcomed

We are doing all in our power to keep CONTRACTORS AND ENGINEERS MONTHLY in the lead as the most practical, helpful magazine for contractors. A large part of my time is spent in the field with contractors but I cannot meet every one of our readers. If there is anything you would like to discuss with me about any article we have published, or about any subject in our field that you think should have more attention, I shall be mighty glad to hear from you. Constructive criticism always helps!

Theodore Reed Kendall

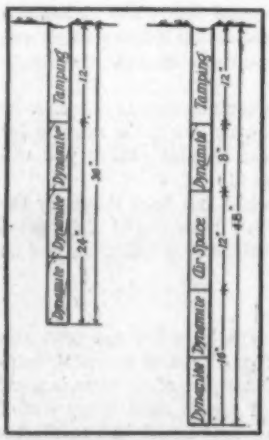


The Cross Section System of Loading. All Holes Are on 19-Inch Spacing with the Cross Rows 36 Inches Apart. The Arrows Show How the Blast Forces the Material Toward the Sides of the Ditch

Two New Methods of Ditch Blasting

NEW methods of ditch blasting have been developed and used in a number of tests during the past year, according to a recent announcement by E. I. du Pont de Nemours & Co. One method, known as the cross-section method, depends on a different system of loading which, it has been shown, moves more material in blasting wide and shallow ditches than is blown out by the same amount of dynamite loaded according to other systems.

Formerly, when the width of a ditch to be blasted required more than a single row of holes, a second row was put in and even a third, fourth and fifth. The new method uses only one row of holes in the center of the ditch and parallel to it, while the balance of the holes are placed in rows at right angles to the ditch sides, with these cross rows 3 to 6 feet apart, depending on the type of soil.



The Diagram Shows the Usual Method of Placing All the Sticks at the Bottom of the Hole (Blast on the Left) While the Hole on the Right Is Loaded by the Air Spaced Method

When a row of charges is fired, part of the force of each separate explosion is equalized, resulting in the force of the bulk of the explosion being exerted at right angles to the row. As the diagram shows, the lines of force which are directed at right angles from each row of charges, join in a semi-circle whose resultant is predominately toward the side of the ditch being blasted. Therefore it clears the material from the path of the ditch.

Another method of ditch blasting is the air spaced or relief method. The essential difference between this method and the usual practice is that instead of placing all the cartridges at the bottom of the hole one on top of the other, the new method allows air space between the bottom charges and a cartridge placed at a specified depth from the surface.

In a typical case of the use of the air spaced method, three sticks of dynamite were placed in the bottom of each hole of a series, leaving a 12-inch space between the top of the uppermost bottom cartridges and one more stick placed with its top a foot below the surface. The top stick was tamped to the surface level. The ditch blown was 5½ to 6 feet deep and approximately 16 feet wide at the top.

While for deeper and narrower ditches the amount of explosives and the depth of the loading varies according to conditions, this method is an important and helpful factor in securing the desired results.

Changes in Specifications for Cement Mortar Protection

WHEN the cement gun first began to be used as a means of applying a mortar composed of sand and cement, engineers had only theory to guide them and very little of that. They reasoned that inasmuch as the voids in sand suitable for use in a cement gun contained approximately 33 1/3 per cent voids a mixture of 3 parts sand and 1 part cement was a proper mixture. This came to be accepted as good practice, so that engineers commonly wrote it in their specifications, and any suggestion of a change was regarded as rank heresy. John V. Schaefer, President, Cement Gun Construction Co., Chicago, Ill., has voiced the feelings of experienced cement gun contractors that the specifications should be more flexible in respect to the sand cement mix and therefore that some changes should be made.

A typical specification is that used by the New York and New Jersey Bridge and Tunnel Commission for the duct walls in the ventilation building of the Hudson Tunnel. In this they specified the mixture should be 1 of portland cement to 3 parts of sand. This was mixed dry before placing in the guns, and they stated that by dry it was meant that the sand might contain a normal content of 4 to 8 per cent of moisture.

In suggesting this 3 to 1 mix originally, two important facts now known were not available to the engineers and they are data regarding rebound and bulking of sand, due to moisture. It is known that ordinary sand as delivered by the carload or truck contains moisture averaging about 6 per cent and on account of this moisture the bulk of the sand is about 33 1/3 per cent greater than the bulk of dry sand. Therefore in 3 cubic feet of sand there is actually only 2¼ cubic feet of sand. When such a mixture is shot, the particles of sand driven at high velocity against a surface bounce off, leaving the cement paste behind and forming what is known as the rebound. The amount of this rebound varies, depending on various circumstances, but on steel bridge encasement it is not less than 25 per cent, and this rebound is practically all sand. The cement mortar protection when in place is therefore not a 3 to 1 mix but a 1.68 to 1 mix, which is not a satisfactory one.

Then the moisture and consequent bulking of the sand varies. The limits are set by the practicability of use in the cement gun. Perfectly dry sand is not good as it hydrates imperfectly in the nozzle and causes excessive dusting. Sand that is too wet is troublesome as it blocks the hose and causes expensive delays. The limits are probably from about 2 to 8 per cent.

To that end the following specification is suggested by Mr. Schaefer: "Material for the cement mortar protection shall consist of an approved brand of portland cement, mixed with clean sharp sand in a proportion that will be as near as practical, 1 of cement to 3 of dry sand. The proportion of the sand shall be varied from time to time, as the bulk of sand exceeds the bulk of dry sand due to moisture. The sand and cement shall be thoroughly mixed dry and screened through a ¼-inch mesh screen before being placed in the pneumatic machine."

Working Through the Asbestos Covering to Weld the 5½-Inch Crankshaft Which Broke Through the Crankpin

Lengthy Shutdowns Not Necessary Today

NOTHING so irks a contractor or can cause so much confusion and loss of time on a construction project as a breakdown, however small, that ties up some piece of equipment. In many cases the breakdown is caused by the failure of some small part which results in a complete tie-up of the job. Such an unfortunate situation usually necessitates ordering a new part or casting and the ensuing delay continues to hold up the progress of the work.

Today there is less reason for such a predicament, for with the introduction of oxy-acetylene welding as a means of plant maintenance and repair, a welder on the job can very often keep things going and avoid long breakdowns or delays.

The repair of a crankshaft here described is typical of the kind of work that he may be called upon to do. The plant where this welder was employed was engaged in heavy production at the time and his speed in effecting this repair made possible the continuance of production when a delay would have proved extremely costly.

The illustration shows a 5½-inch crankshaft which broke through the crank pin. As the original was only 3⅝ inches long, only a small knob projected. It was chamfered to a double vee with the cutting blow-pipe, and the surface carefully cleaned with a cold chisel and wire brush. The shaft was then secured to a heavy leg of the welding table in a vertical position and the end section leveled and blocked in position with 3⅝ inches between the cranks. When it had been trued up, five ½-inch stay bars exactly 3⅝ inches long were cut and tack-welded to the throws. This was done to make the welding easier and to keep the pieces rigid while the shaft was being turned and moved around.

When the stay rods were all welded, a ½-inch weld was made at the center of the chamber, and then the section to be welded was laid down horizontally and thoroughly preheated. Welding was done through a hole in the asbestos paper covering. The hot metal facilitated the completion of the job and minimized the local effect of the welding flame.

After the shaft was welded, the pin being built up so that it could be subsequently machined to size, it was annealed in order to relieve the last traces of internal strain. Machining was the last step in the repair, and soon work was in full progress again after only a few hours delay.

Complete Concreting Plant Mounted on a Truck

WHEN 25 contractors all bid on the same job, the owner is apt to be certain that the low bidder will be contributing part of his own money, if he is to complete the contract. When a large number of the bids range in the neighborhood of $24,000 and the low bidder submits a figure of $18,000, it stands to reason that the low man must have done some very sharp thinking if he is to come out ahead. The *California Constructor* reports an interesting instance where this actually happened last May at Long Beach, Calif.

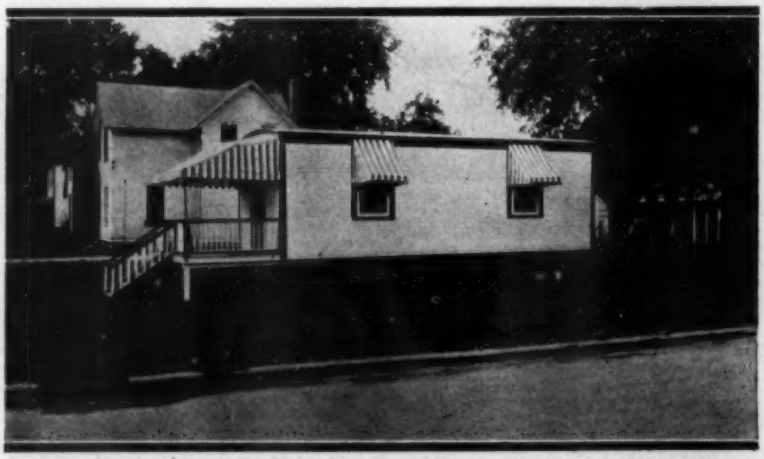
The Los Angeles Branch of the Sumner Sollitt Co., was the low bidder, and there was no question as to the responsibility of the contractor. The job was to build for the Rio Grande Oil Co., a 40-foot high concrete retaining wall 2,200 feet long at the company's Long Beach Harbor Terminal. The materials were furnished at the site.

In two months' time the job was completed by the use of a truck on which was mounted a mixer and a mast. The wall had an asphaltic expansion joint every 60 feet so that the wall was poured in sections and it was also desired that certain parts of the wall be completed before other parts were started.

The concrete for the foundation was poured with a paving mixer with the aggregate received in batches by truck and the concrete deposited by the mixer directly into the foundation forms. The concrete for the wall was placed with a 7-foot Bremer mixer placed on the truck with a steel hoisting tower so that the mixer discharged the concrete to the hoist skip which was raised and the concrete deposited through chutes into the forms without the use of buggies or scaffolding.

An innovation in form work was the use of corrugated iron on the wooden panels so that the face of the wall has a panelled effect. Panel forms were used throughout, being held together at the bottom with Bosco band iron clamps and above with Willard Bulldog clamps.

The wall enclosed approximately 6 acres in which are located a number of large gasoline and oil tanks. The wall is designed to resist a pressure of about 17 feet of oil in case an accident would let the oil from the tanks. The wall is 2 feet 8 inches thick at the bottom and 8 inches at the top, has a foundation 12 feet 8 inches wide and has counterforts 15 feet on centers on the back of the wall.



The Portable Home of the Henkel Construction Co., Mason City, Iowa. Photograph Taken in Mendota, Ill.

Excavating for and Laying 36-Inch Reinforced Concrete Pipe in an 11-Foot 2-Inch Sewer Tunnel with a ½-Yard Byers Trencher Shovel

Laying a Sewer Within a Sewer

DIGGING trench and setting pipe in a shallow semi-round sewer tunnel through which is continually passing steaming hot water affords plenty of excitement for the Ralph Bucci & Co. crew which is working under the Homestead Steel Works Co. plant in Homestead, Pa. Drainage water, which flows into the tunnel directly from the steel mill, is always very hot and steaming as it mixes with water in the creek.

A sanitary sewer under the bed of the creek with a 4-foot deep trench is being dug and set with 36-inch reinforced concrete pipe through the entire length of the 1,000-foot tunnel. Ralph Bucci & Co., Pittsburgh sewer contractors, took the job after comparing the 13-foot headroom in the tunnel with the 11-foot 2-inch clearance of their Byers ½-yard trencher shovel.

Bucci found that the best method to handle this job is to use the trencher shovel boom, taking off the dipper and arm, and substituting a ½-yard clamshell bucket. The bucket is replaced with a hairpin hook for pipe setting.

Eighty lineal feet of trench is being excavated and an equal amount of pipe being set in 10 hours. Pipe laying is delayed because all joints must be sealed with tar and allowed to set before moving on to the next section..

An additional thrill to the workers on this job was anticipated when it was learned that during heavy rain storms the water in this tunnel sometimes rises to a 6-foot flood torrent. However, only fair weather has prevailed since the Bucci crew entered the tunnel.

Gas-Powered Equipment Does Heavy Work for Oil Refinery

MOVING 500,000 CUBIC YARDS OF DIRT IN GRADING 100 ACRES OF LAND BY A. F. HARTIGAN CO., HAMMOND, IND., FOR THE SITE OF AN ADDITION TO THE PLANT OF THE GULF REFINING CO., EAST CHICAGO, IND.

1. A Monarch-75 pulling a land leveler made quick work of smoothing out minor irregularities. 2. Close-up of Monarch-75 pulling a heavy load through rough going. 3. A Northwest crawler shovel loading spoil into a Western crawler dump wagon at one of the high spots

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

BUS. VOL.—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

Arborio Road Construction Co., Inc., Hartford, Conn., 525 Main St. Organized: May 2, 1921. Bus. vol. C. Officers: John Arborio, President; Joseph E. Arborio, Vice President; William M. Lees, Secretary. Major contracts: arch bridge, Westchester County Park Comm.; waterbound and bituminous macadam roads, State Highway Dept. of Conn.; waterbound, gravel and bituminous macadam roads, State Highway Dept. of Maine; concrete and bituminous macadam roads, State Highway Dept. of N. H.; gravel, bituminous and concrete roads, State Highway Dept. of Vermont. Member: A. G. C.; New England Road Builders Association.

J. A. Kreis & Sons, Inc., Knoxville, Tenn., Burwell Bldg. Field and Temporary Branch Offices: North Wilkesboro, N. C., Gray Summit, Mo., Council Grove, Kansas. Organized: September, 1926. Bus. vol. B. J. A. Kreis, President, has been engaged in the construction business since 1900. His father, before that date, was a contractor and took his two oldest sons, J. A. Kreis and S. F. Kreis, into business with him, the name of the partnership being H. Kreis & Sons. In 1910 H. Kreis retired and S. F. Kreis sold his interest to J. A. Kreis. At present Mr. Kreis' three sons, R. H. Kreis, J. E. Kreis and A. J. Kreis, are in the business with him, the organization having been incorporated in 1926. The following partnerships were formed in order to subcontract work: Kreis & Howard Bros., 1920; Kreis & Jones, 1921; Kreis & Howard, 1921; Kreis & Edington, 1927; Kreis & Carey, 1928. Officers: J. A. Kreis, President; R. H. Kreis, 1st iVee President; J. E. Kreis, Vice President; A. J. Kreis, Vice President; C. Leach, Secretary and Treasurer; M. W. Duncan, Engineer and Director; Frank Malloney, Consulting Engineer and Director. Major contracts: Frisco Railway Co., 45 miles single track railroad, including track laying and structures, from Demopolis to Kimbrough, Ala., $1,450,000; Cookville, Tenn., Dam, $150,000; Missouri-Pacific Railroad, 17 miles double track, including two tunnels, $2,000,000; approaches to Vicksburg Bridge at Vicksburg, Miss., $275,000; Tennessee Highway Dept., 17 miles of road in Huntsville, Tenn., $375,000.

J. A. Kreis

A. J. Kreis

Christensen Bros., Urbana, Ill., 406 Griggs St. Organized: 1923. Bus. vol. D. Officers: B. J. Winter, Christ Christensen and Celius Christensen, partners. Type of contracting: sewer, water and drainage.

Photo by Blank & Stoller

G. A. McWilliams

McWilliams Dredging Co., Chicago, Ill., 75 East Wacker Drive. Branch office: Canal Bank Building, New Orleans, La. Organized: August, 1917. Bus. vol. B. G. A. McWilliams operated as a drainage contractor from 1892 to 1907, when he entered into a partnership as R. H. & G. A. McWilliams. In 1917 the McWilliams Dredging Co., was formed and is one of two companies from the old partnership. Officers: G. A. McWilliams, President; W. R. Ewing and William Herman, Vice-Presidents; W. H. McDonough, Secretary and Treasurer. Major contracts: 1929, drainage and dredging for the Austin Co., East Peoria, Ill.; Greater Peoria Sanitary and Sewer Disposal District, Peoria, Ill; Lacey Drainage and Levee District, Fulton County, Ill.; Louisiana Highway Commission Projects in St. John's and St. Charles Parish, La.; Spring Lake Drainage and Levee District, Tazewell County, Ill.; St. Landry and St. Martin Drainage District, St. Landry and St. Martin Parish, La.; Kelly Lake and Drainage District, Schuyler County, Ill.; emergency work on Illinois River; East Peoria S. L. and Drainage District, Tazewell County, Ill.; construction of dipper dredge and barges for state of Illinois; Clagette and Lakeland hydraulic fills, Bonnet Carre spillway and Lower Mississippi River work for U. S. A. Member: A. G. C.; Mississippi Valley Contractors' Association.

Photo by Blank & Stoller

W. R. Ewing

Amos D. Bridge's Sons, Inc., Hazardville, Conn., 7 Fairlawn Ave. Organized: 1907. Bus. vol. B. This business was started by Amos D. Bridge, who in 1890 started contracting for state road jobs, continuing until his death when the business was incorporated and has been maintained up to the present. Officers: H. Stephen Bridge, President; Charles A. Bridge, Treasurer; Homer E. Bridge, Secretary. Major contracts: 1927, road, Silver Lane, Conn.; 1927-8, road, Ogunquit, Maine; road, Dover, N. H.; road, Plymouth, Mass.; 1927-8-9, road, Augusta, Maine; 1928, road, Glastonbury, Conn.; 1928-9, road, Manchester, N. H.; road, Templeton, Mass.; road, Bloomfield, Conn.; road, Kingston, Mass. Member: New England Road Builders Association.

Wilbanks & Pierce, Inc., Rosedale, Miss. Organized: November, 1924. Bus. vol. D. This company which specializes in hydraulic dredging was organized in November, 1924, as a partnership. It was incorporated February 1, 1926, in the state of Florida. Officers: John R. Wilbanks, President; R. C. Pierce, Vice-President and Treasurer; B. E. Pierce, Secretary. Major contracts: water front development, Bradenton, Fla.; Whitefield Estates, Sarasota, Fla.; Pass Christian Chicago Land Co., Pass Christian, Miss.; U. S. Government levee, Onward, Miss.; U. S. Government levee, Rosedale, Miss. Member: A. G. C.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Highway Contractor's Duty to Safeguard Travelers

The reports of the courts show that highway contractors are frequently made defendants on account of injuries to motorists who have driven into unguarded obstructions or excavations on highways under construction and yet open to travel.

In one of the latest appellate court decisions on this subject, and in affirming judgment in favor of claimant in that case, the North Dakota Supreme Court said in an opinion handed down August 10, 1928 (Axelson vs. Jardine, 223 N. W. 32):

"There was no lantern placed on the pile of dirt on the east side of the ditch, the direction from which the plaintiffs were coming, and there was no light on the pile of dirt on the west side of the ditch for some time before the accident. The plaintiffs did not see any light as they approached, and they found the lantern after the accident on the side of the pile of dirt on the west side of the ditch; considerable of the oil had run out and covered the sides and bottom of the lantern. It is well settled that—

"'A breach of the duty to erect barriers, or to place lights, or reasonably and carefully to maintain obstructions to public travel, constitutes actionable negligence, for which the contractor is liable when it is the proximate cause of any injury to one lawfully using the street.' . . .

"Whether or not one contracting to make street improvements is negligent in failing to maintain barriers or watchmen to warn the public when he obstructs the traveled way is ordinarily a question for the jury. . . . And it is also ordinarily a question for the jury whether a guard or barrier actually erected was sufficient protection. . . . It is ordinarily a question for the jury what precautions are reasonably necessary in a particular case, and whether barriers and lights were sufficient and whether the lights were properly arranged were also questions for the jury."

When Conspiracy to Suppress Competition Avoids Contract

In the case of Morgan vs. Gove, 275 Pac. 415, disposed of by the California Supreme Court March 7, 1929, the court finds that competition in bidding for a sewer construction contract was stifled by rival combinations of bidders, and set aside the award to one of the conspirators, saying, in part:

"Whether or not a combination such as this succeeds is immaterial. The only question is whether such combination has the tendency or necessary effect of lessening in some degree the competition which should surround the bidding for the public work. This may be illustrated by reflecting upon what the effect upon the minds of the public authorities might have been when they saw these three bids. . . . They would immediately have been warranted in coming to the conclusion that the figures bid were approximately correct and reasonable or else three independent minds would not have reached so nearly the same estimate. This is not a case of joint bidders where the facts are known. It is a case where a combination between the bidders was concealed and the public authorities were deceived as to the true nature of the transaction."

Validity of Bids for Public Works Where There Is an Insufficient Deposit

A taxpayer attacked contracts for subway construction in New York City, on the ground that the successful bidder had deposited but half the amount that other bidders had deposited under the terms of the bidding. Overruling this objection, in an opinion handed down March 9, 1929, in the case of Manhattan Security Corp. vs. Delaney, 233 N. Y. Supp. 241, the Supreme Court for New York County, Special Term, noted that there were special circumstances tending to excuse failure to deposit $100,000 instead of $50,000, but added:

"Even assuming that the deposit was inadequate, the illegality of the bid cannot be contested by a taxpayer, unless its acceptance results in waste to the city. . . . An attempt is made to show this by the argument that the unfair advantage . . . interfered with free competition, and thus resulted in public detriment. If there were any showing that other contractors had attempted to make deposits under similar conditions, and had been denied such opportunity, the situation might support the charge, but, in the absence of such facts, the alleged unfair advantage plays no part in the award, and cannot be said to result in possible waste to the city, directly or indirectly."

Right to Hold Contracting Officers of a Corporation Individually Liable Denied

The fact that a corporation organized under the laws of another state may not have complied with the laws of the state in which business is done, regulating the conditions on which a non-resident corporation may do business there, does not entitle the other contracting party to hold individually liable on the agreement the officers or agents who made the contract on the part of such corporation, if suit might be brought against the company itself.

That is the gist of the decision reached by the Pennsylvania Supreme Court in the case of Bala Corp. vs. McGlinn, 144 Atl. 823, decided January 7, 1929. In that case suit was brought against defendants for breach of an agreement they had made on the behalf of a non-registered foreign corporation. But the court upheld dismissal of suit, saying, in part:

"While plaintiff denies knowledge of the fact that the Merrill Realty Co., was not registered, it knew the contract was with the corporation, and . . . was not prejudiced by its failure to register. Plaintiff, having knowingly dealt with the corporation as such and having full right of action against it, there is no reason why the officers, who are charged neither with fraud nor falsehood, should be held individually liable. The cases where such liability has been sustained were . . . based largely upon the fact that the plaintiffs contracted with individuals and were ignorant of corporate existence. . . .

"Furthermore, it is a general rule that one who deals with a corporation, knowing it to be such, cannot enforce individual liability against the officers and agents who act for the corporation. . . .

"The mere fact that the agents might be punished for neglecting to register would not render them liable for the contracts of the corporation."

Rights on Abandonment of Work by Contractor or Subcontractor

The right of a contractor against the surety of a subcontractor on the latter having abandoned a job were considered by the United States Circuit Court of Appeals, Ninth Circuit, in the case of Federal Surety Co. vs. Lalonde, 31 Federal Reporter, 2d Series, 673, decided March 25, 1929.

The court assumed, for the purpose of the case, that the surety stood in as favorable position as an owner would on a principal contractor having abandoned work. Even under this assumption, which the court intimates was more favorable to the subcontractor than permitted by law, the case was decided against the surety company.

The state of Montana awarded a highway contract and the principal contractors sublet the job at 87½ of the contract price. Performance of the subcontract was secured by a surety bond in favor of the principal contractors, and the principal contract was secured by the same surety in favor of the state.

The subcontractor abandoned the work before its completion and the surety company finished the job, as surety to the state, and refused to account to the principal contractors for any profit in their favor, claiming that more money had been expended in completing the job than was called for by the bond. But the court upheld judgment in favor of the principal contractors, saying:

"In actions of this kind, where a contract has been abandoned by a contractor, the measure of damages is the reasonable cost of completing the contract according to its terms over and above the contract price; and if the owner has already completed the contract, the measure of damages is the amount necessarily and prudently expended in excess of the contract price. And if we assume that a surety company, upon taking over work after abandonment by the contractor, is discharged from further liability when in the completion of the contract it has expended an amount equal to or in excess of the penalty of the bond, it must at least appear that the money was prudently and necessarily expended under competent supervision."

The court finds from the evidence that the surety company placed in charge of the work a man incapable of properly supervising the work, and could not assert improvident and unnecessary expenditures against the principal contractor's right to its profit and to reimbursement for advances made to and for the subcontractor.

But in the closing paragraph of the opinion the court intimates that even where a surety has prudently and necessarily expended funds in excess of the penalty of its bonds, in completing an abandoned job, that does not necessarily avoid liability to the obligee of the bond in a case of this kind.

Deposits on Bids for Public Work—Awards on Combination Bids

There was lively bidding on four contracts for work carrying an aggregate estimate of $54,000,000 and involving the construction of a tunnel from Yonkers to South Brooklyn. Award was made to Patrick McGovern, Inc., on a combination tender, and suit was brought by unsuccessful bidders to enjoin the Board of Water Supply of the City of New York from carrying out the award.

The award was attacked on the grounds that excessive bidding checks were required ($400,000 on each of the four contracts) to be deposited and that separate awards should have been made on the four contracts. The complaining bidders were low on some of the separate contracts.

Dealing with these points, and also, preliminarily, with the right of the plaintiffs to sue, the Appellate Division of the New York Supreme Court said in the case of Del Balso Construction Corp. vs. Gillespie, 232 N. Y. Supp. 261:

"Plaintiffs sue as taxpayers, but are more obviously interested in the securing of two of the contracts, on which they were the low bidders when the contracts are considered separately, than they are in saving the taxpayers' money. However, their motive does not alter their right to the remedy, if their allegations are proven satisfactorily. . . .

"As to the point raised concerning the amount of the deposit required, the board is permitted by the statute to require that there shall be deposited a certified check to an amount not less than 5 per cent of the amount of the bond or security required for the faithful performance of the work, and the act continues: 'Such amount need not, however, in any case exceed $100,000.' Section 28. Obviously, this section of the act does not prohibit a requirement for a bidding check in excess of $100,000. If it was intended that the maximum amount for a bidding check on such a contract should be $100,000, this language does not accomplish that effect. There was apparently a discretion lodged in the board as to the amount of the bidding checks to be required, unrestricted by this alleged limitation. . . .

"The estimated cost by the engineers of the board of water supply for the four contracts was $13,500,000 on each contract, or $54,000,000 in all. Bidding checks of 5 per cent of this total for all four contracts would have been $2,700,000, whereas the total required under the contracts was only $1,600,000. It cannot be said that this was discriminatory in so large a contract. . . .

"There was only one other contractor who bid for the four sections. Its bid aggregated over $53,000,000. It offered a deduction of $1,910,000. The bids of the McGovern Co., on the four sections, without the deductions, amounted to $44,000,000 and over, and with the deductions of $1,800,000 were nearly $9,000,000 less than the combined bids of the other contractor. Nobody was prevented from bidding on the four contracts, nor has any one claimed that McGovern Co.'s bid on the four contracts would do harm to the taxpayers; thus no elements necessary to the maintenance of a taxpayer's suit are present. The board was not compelled to let any one of the contracts to the lowest bidder. If it intended to favor this bidder, it might have made the award according to the plaintiffs' interpretation as a matter of discretion, and its power could not well be gainsaid.

"In order to set aside this award, there must be some illegality or fraud shown."

Notifying Surety of Default Under Bond

General contractors who seek to enforce bonds given by their subcontractors, as well as owners who make claim under bonds given by general contractors will be interested in what the United States Circuit Court of Appeals, Fourth Circuit, decided April 9, 1929, in the case of Maryland Casualty Company vs. Fowler, 31 Fed. 2d, 881.

It was decided that failure of an owner to give notice to a contractor's surety of delay in completing a job did not preclude the owner from enforcing liability on the bond for subsequent abandonment of the job.

The job was to be finished by the middle of November but there was a delay, and the owner did not notify the surety, as provided for in the bond. The contractor was permitted to proceed and the owner continued making progress payments. But in February, the contractor threw up the work and absconded. Then claim was made on the bond, not for delay, but for abandonment of the work. The circumstances showed that the surety company had been advised concerning the progress of the work and that it could not have been prejudiced by failure to receive formal notice of the contractor's delay.

"Under these circumstances, we do not think that the company was discharged from liability by reason of the fact that the board of education did not give notice of default when the building was not completed on the day specified in the contract. While there is some conflict in the decisions on this point, we think that the correct rule is that a failure to give such notice is a defense to a claim for delay only, and that it constitutes no defense to an action arising from breach of other covenants of the contract."

Construction Industry News

Independent Pneumatic Tool Co., Chicago, Ill., has announced two recent changes in its organization. R. E. Kelly, formerly Manager of the Boston office, has been made Sales Engineer for the Eastern District, with headquarters in New York. John Ashton, salesman in the New York District, has been appointed Manager of the Boston office.

Alexander Milburn Co., Baltimore, Md., has recently opened an office in Los Angeles, Calif., as the Alexander Milburn Sales Co., located at 1855 Industrial St., Los Angeles. George R. Roberts is in charge of this office.

Chain Belt Co., Milwaukee, Wis., has recently opened its eighteenth branch office in the United States at 950 Park Square Building, Boston, Mass. J. K. Merwin, formerly of the Cleveland office, is district manager. The Boston office will manage the distribution throughout New England of the company's entire line of conveying systems, power plant equipment, chains and transmission machinery.

Hercules Powder Co., Wilmington, Del., has announced two recent changes in its personnel. J. J. Kelleher has become associated with the contractors' division, Explosives Department. Mr. Kelleher is experienced in the explosives field, having done considerable work in this line throughout the Southwest, and will make his headquarters at the home office. J. R. St. Clair, formerly of the sales force of the Hercules branch office in Duluth, Minn., will soon join the Explosives Technical Service Staff and thereafter will be located at the home office in Wilmington.

Alexander L. Schuhl, Manager of the Philadelphia office of the Independent Pneumatic Tool Co., died suddenly on October 20 following an illness of a few days. Mr. Schuhl had been connected with the company since 1917 and Manager of the Philadelphia office since 1924.

Gardner-Denver Co., Denver, Colo., has announced the opening of a Cleveland office which provides space for sales rooms and storage. C. C. Arnold is in charge.

The American Cable Co., whose Chicago office was previously located at 160 North La Salle St., moved recently to Room 1765, Chicago Daily News Bldg., Chicago, Ill.

MultiFoote 27-E Paver Pouring Street Intersections in McComb, Miss.

Plan to Overcome Losses Caused by Five-Day Week

ARCHITECT, builder and labor, at a recent meeting of the New York Building Congress, pointed out that new design, new methods and closer cooperation are necessary to offset the loss of time brought about by the five-day week. All stressed the necessity of more cooperation between the architect, contractor, labor and owner in order that through this channel operations may be simplified and gains made which are necessary to carry the five-day week.

Architects are working to simplify and modify building design in order that buildings will be most adaptable to quick and efficient construction which is characteristic of mass and quantity production. The attitude of the architect on this subject is that more effort should go into quality than into the elaborate effects which at one time were considered necessary.

The problem of the builder in this united effort to prevent the cost and the time of building from being influenced by the introduction of the five-day week is quite different from that of the architect. The builder must improve his methods of operation so that he can accomplish in five days what previously required five and a half days to do. Labor-saving devices, new and improved methods of operation and more careful planning of the work will make possible a sufficient increase in production so that the higher labor rates will be absorbed.

Again, the planning and management can be improved. Builder and laborer alike must be made to realize that in paying and accepting this increased wage, they also accept a responsibility to turn out more and better work than ever before.

The representative of labor also stressed the importance of cooperation, and all expressed a hope and confidence in the success of this very great economic change which has been brought about in New York City in the introduction of the five-day week.

The Law of Building Contracts and Mechanics Liens

WHAT every owner, contractor and subcontractor, engineer, architect, mason, plumber, carpenter and material man should know about The Law of Building Contracts and Mechanics' Liens is set forth in a recent book of that name by Myron H. Lewis, C. E., L. L. B. This book is a compilation of useful data from various sources, collected by the author during the course of his own experience in building and adjusting mechanics lien claims. The material consists mainly of simple statements of statutory rules and decisions of various courts which should be useful to all those who in any manner are interested in building and construction lines.

The first part is given over to a discussion of contracts, their general nature and development, their necessary elements, rights and obligations of those engaged in work under contract, delays, abandonment, payments, installments, waivers, sureties, proper and improper performance and other subjects of general interest. The second part discusses what things the lien protects, who is entitled to protection, the property that is affected, the extent of the protection, preparing, filing, bonding, foreclosing, discharging and waiving liens, the lien as affected by the contract and its performance and the proposed new lien law.

The section on building contracts is applicable to almost all states, while the section on liens covers New York State. It is the intention of the author to add supplements covering other states from time to time.

This book, the purpose of which is the edification of the lay reader on the subject of contracts and liens that he may enter into and use them more understandingly and wisely, is published by the author, Myron H. Lewis, Room 1006, 507 Fifth Avenue, New York. Price: $2.00, excluding postage.

Horses for Manufacturers' Road Show Exhibits

MANY exhibitors at the Road Show in Atlantic City in January will find it convenient to use Toledo horses, made by the Toledo Pressed Steel Co., Toledo, Ohio, in their booths in place of tables. These sturdy pressed steel frames offer an ideal means for setting up temporary tables or benches for display purposes. They are available in ranges of 6-inch heights from 18 to 60 inches and are made for 1-inch and 2-inch lumber. The 25-inch and 32-inch heights are made for 2-inch standard-sized lumber.

The Toledo Steel Horse Set Up

The Frame Folded Up

All that is necessary in setting up these horses is to set the lumber between the jaws and press down on the toggle cross member, which spreads the feet and closes the jaws. The jaws bite down as well as in, binding the rail firmly on three sides. The toggle locks in place by simply passing the dead center position. It has no springs and no complicated locking mechanism. Dismantling is accomplished simply by raising the center of the toggle. The horses fold compactly when not in use.

Any horse ordered for use at the 1930 Road Show will be shipped to Atlantic City with the exhibit of the Toledo Pressed Steel Co., and delivered direct to the booth.

Examples of Inspection Service

THE type of inspection service offered by the Pittsburgh Testing Laboratory, through its executive offices and main laboratories at Pittsburgh, Pa., and its branch offices in Atlanta, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Easton, Houston, Indianapolis, Milwaukee, New Orleans, New York, Philadelphia, St. Louis and Tampa, is well known in both the municipal and construction fields.

Four examples of the use of PTL service showing its neutral character and its value to clients are of particular interest. A water works client employed the Pittsburgh Testing Laboratory to inspect cast iron pipe, delivery of which was to be made from stock. The inspection disclosed the fact that the bells were too large. As an emergency existed and as the foundry was anxious to move this stock, the Pittsburgh Testing Laboratories recommended acceptance, provided the cost of the excess lead required for the joints be absorbed by the foundry. Both sides agreed. The buyer saved the cost of extra lead which was approximately three times the inspection fee and he received the pipe on time.

A large municipality built a concrete viaduct and placed inspectors from the City Engineer's office at the work. When the job was finished and the forms were stripped, certain portions of the structure were so badly honeycombed that grave doubt existed in the minds of the public as to the safety of the structure. The Pittsburgh Testing Laboratory was employed to examine the structure which involved coring of specimens from the structure. These disclosed the fact that structually the job was sound and that the honeycombing was confined to the surface only. This cost the contractor many thousands of dollars as he had to pay the cost of the examination and repair the structure. Adequate inspection would have saved this loss.

Another example of interest to contractors involved the construction of an office building in a mid-western city. No provision had been made for inspection in the fabricating shop but the Pittsburgh Testing Laboratory was called in to handle the field inspection. Much difficulty was encountered in making field connections due to errors made in the fabricating shop. Many changes had to be made. Some pieces had to be scrapped and new ones furnished. The contractor was delayed five weeks in his building program. Back charges amounted to approximately $2,000. Proper shop inspection, costing about $500, would have eliminated most of the trouble.

In another city an office building was under construction. Bids were asked by the contractor for inspection of erection. The PTL service was offered for a fee of $600. Another firm bid $300 and was awarded the job. One entire floor system was erected upside down and was not discovered until riveting of other connections began. It cost the builder $720 to cut out and re-set the floor and delayed construction three weeks.

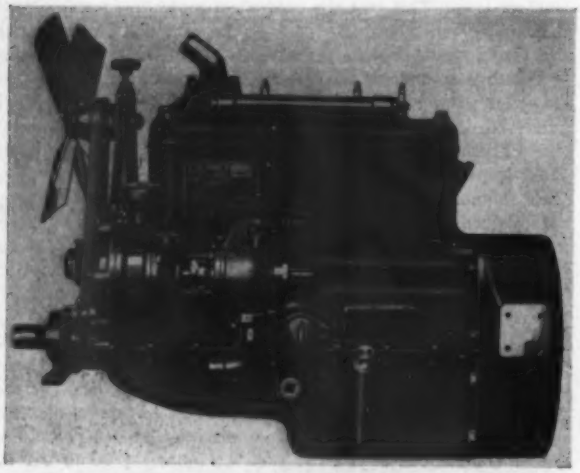
A Blast Hole Drill Mounted on Crawler Tractor Wheels

A NEW Clipper blast hole drill with crawler type traction wheels, designed to go over soft ground or where a wide and long traction surface is desired, is manufactured by the Loomis Machine Co., Tiffin, Ohio. The crawler wheel allows the weight at the point of traction to be distributed over a large surface, thus avoiding digging in when power is applied and also eliminates wallowing when in a mud hole.

It is made with one slow speed or can be furnished with two speeds for moving, a slow speed for bad and soft places where desired, and a faster speed for ordinary road travel. Aside from this, it has a variable speed engine which can be run at such suitable speed as may be desirable on either low or high gear.

The drilling machine with spudding beam only has a frame 50 inches wide, 20 feet long with sills 4 by 12 inches. Cross sills are 7 by 12, 4 by 12 and 5 by 12 inches. All shafts are of ample size and strength. The band wheel is 66 inches in diameter with a 13-inch face and the metal friction wheel on the rope spool is 42½ inches in diameter. The round front wheels takes a 14-inch tire unless a narrow one is required by the user. A special variable speed back-geared 4-cylinder gasoline engine is attached to the frame of the machine. The machine can be furnished in a steel frame and is also made with round tractor wheels and in a non-tractor portable type.

A Clipper Blast Hole Drill Equipped with Crawler Wheels, Adjusting Itself to Uneven Ground



The Accessories Side of a Hercules Heavy-Duty Engine

New Heavy Duty Engines in Lower Horsepower Ranges

TO meet a demand for heavy-duty engine power in the lower horsepower ranges the Hercules Motors Corp., Canton, Ohio, has developed the 00 series of 4-cylinder engines. Built in three models, the 00 series are small counterparts of the Hercules 0X series and are developed for universal application. The 00A, 00B and 00C models, which comprise this series, have bores of 3½, 3¾ and 4 inches respectively, and a common stroke of 4½ inches. They are identical in general design and the majority of the parts are interchangeable among the different models, the only difference being in the bore sizes and the parts affected thereby. All models develop maximum torque at 1,000 rpm and peak at 2,200 rpm.

Among the special features of these engines is the valve cooling. The water is conducted from the water pump directly across and through the block and distributed into a passage immediately between the valves and the cylinders. The valves are thus completely surrounded by water. As a further aid to valve cooling, the valve guides are brought up very close to the valve heads, to dissipate more quickly the heat absorbed in the heads. The water pump is of the centrifugal, high pressure type and is capable of providing ample circulation for engine cooling at all speeds. The fan is driven by a pulley located directly on the front end of the crankshaft.

Lubrication is full force feed. The pump is located beneath the center main bearing and driven from the camshaft by spiral gears. The shafts and gears of the oil pump are case hardened. Oil pressure can be adjusted easily to suit operation requirements. Crankcase ventilation is provided by a breather cap located directly over the accessory drive shaft. This opening also serves for filling the oil sump.

As in all Hercules engines, the 00 series models have the crankcase cast integral with the block. The crankshaft is 2 inches in diameter at the three main bearings, of which the front is 2 3/16 inches long, the center 2¼ inches and the rear 2⅜ inches long. The connecting rod bearings are 2 inches in diameter and 1½ inches long. The pistons are of cast iron, and carry three rings above the pin. The lower of these rings is an oil regulating type. The rings of all the 00 engines are 3/16 inches wide, with turned face that operates on the smooth surface of the carefully honed cylinders. Piston pins are of nickel molybdenum steel and are 1 inch in diameter. Each pin is securely locked in its connecting rod by a clamp bolt and operates in two cast bronze bushings in the piston. Connecting rods are of the H-section type and have a center to center length of 8 inches.

The camshaft is on the right-hand side, supported by four bearings 1 15/16 inches in diameter. The front camshaft bearing is 2 inches long and the other three 15/16 inches long. The diameter of the shaft between the cams is 1¼ inches, and the camshaft is driven by helical gears having a face width of ⅞ inches.

The engines are of the L-head arrangement and the valves are the usual 45-degree set type. The exhaust valves have a clear diameter of 1⅜ inches and the intakes of 1½ inches.

Another feature of the Hercules 00 series is the provision for a wide choice of accessories. Immediately in front of the water pump is provision for battery ignition by distributor, while any standard size magneto can be driven from the rear of the water pump shaft. In the center of the block near the center line of the camshaft is an opening for attaching a pipe for thermo-syphon cooling. The front support of the engine is furnished by a neatly designed bracket located on the gear cover. This bracket can be supplied for either three or four point suspension. Provision is also made for mounting a governor.

Either a No. 4 or No. 5 S. A. E. flywheel housing is supplied. As it is separate from the crankcase it can be changed to suit individual requirements. Provision for mounting an electric starter is made in these housings. The starter flange is a No. 1 S. A. E., using a thirteen-toothed pinion. The flywheel can also be used to meet particular specifications permitting the use of any type of clutch that will fit in the housing. A flywheel with teeth cut directly into the rim itself is used when a self-starter is desired.

Sheet Pile Drivers

SHEET pile drivers which are formed by the substitution of suitable front end parts on the Sullivan K-2 and K-4 busters are made by Sullivan Machinery Co., 400 North Michigan Avenue, Chicago, Ill. These drivers, Q-1 and Q-2, are convenient sheeting hammers and weigh 104 and 112 pounds, respectively.

The Sullivan busters are converted to sheet pile hammers by removing the chuck housing and steel retained, and in the case of K-4 the anvil block, and adding a special anvil block or hammer, a guide, cheek plates, step plates and special side rods. The guide is a heavy steel casting, machined to fit the front end of the cylinder and buffer ring. It has two sets of lugs to which the side rods are secured. This permits the guide to be set on the tool so that the slot for the sheeting may be either parallel or at right angles with the handles.

The cheek plates are of flat steel, held in place by screws, and are of different thickness to accommodate sheeting from 2 or 3 inches in thickness. The hammer is usually assembled to take 2½-inch piling. For 3-inch material, one of the cheek plates is removed. The step plates are heavy angle irons bolted to the guide, and afford a foothold for the operator.

The Sullivan Q-1 Pile Hammer

Where Performance Counts

THE Marcus Contracting Company reports extraordinary service from its LaBour self-priming centrifugal pumps on the Nassau Street subway job in New York City. The service obtained from the pump shown above, operating below the World Building, is typical. Month after month of continuous, unfailing operation has been delivered by this pump without a single cent spent for repairs.

Such gratifying performance results from special constructional features that enable LaBour Pumps to handle water containing sand, mud, sludge, etc., without impairing their pumping efficiency.

Available in various capacities, for portable or stationary installations, LaBour Pumps can be found giving faithful and efficient service of long duration on jobs where enforced shut down would mean a serious loss of time and money.

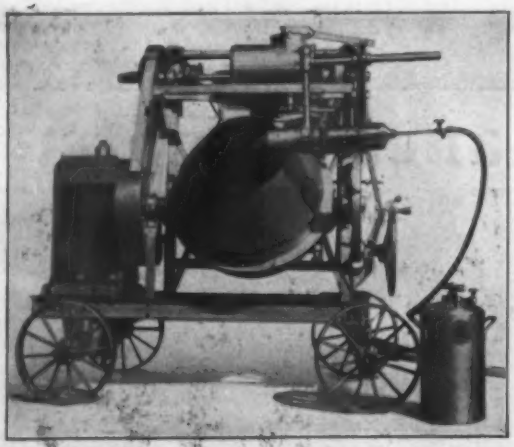
See Our Exhibit at the POWER SHOW
BOOTH 31
Grand Central Palace New York City

December 2 to 7 1929

THE LABOUR COMPANY, INC.
Elkhart, Indiana

LA BOUR PUMPS

NEVER LAY DOWN ON THE JOB



The Littleford Heating Attachment in Place on a Tilting Drum Mixer

A New Heating Attachment for a Concrete Mixer

A NEW universal concrete heating attachment for tilting drum mixers with capacities of 5 cubic feet or over has recently been developed by Littleford Brothers, 500 East Pearl Street, Cincinnati, Ohio. This attachment is clamped on any angle or flat iron brace on the mixer and can be adjusted in less than 5 minutes. There are no holes to drill or brackets to fit. Two set screws are tightened and the attachment is in place.

The use of such an attachment aids in winter construction, making it possible to maintain the concrete at the proper temperature while mixing.

A New Concrete Accelerator, Anti-Freeze and Hardener

WITH the approach of winter when concrete must be handled much more carefully than at any other time of the year, announcement is made of a new integral liquid compound to assist contractors in making better concrete. Acqua-Pruf is a compound of standard chemicals and has an affinity for portland cement. The degree of acceleration in the set of the concrete is in direct ratio to the amount of Acqua-Pruf used. One quart to the bag is the standard proportion that has by test produced a compressive strength 50 per cent in excess of untreated concrete. This enables walks, paving, etc., to be opened to traffic in 24 hours.

The waterproofing qualities of Acqua-Pruf are of interest. The addition of this compound results in a denser concrete, reducing capillary attraction to a minimum. It also produces a chemical reaction within the pores of the concrete which results in the formation of crystals that entirely fill these pores. On concrete roads cured with this material an interesting condition has been noted. The usual stains from engine oil dropped by passing automobiles are washed off during rainstorms, leaving a clean pavement.

Acqua-Pruf treated concrete can be poured at temperatures as low as 10 degrees above zero. For walls, floors, mortar and paving above 28 degrees Fahrenheit the usual amount of the compound is used. For every 3 degrees lower the manufacturers, Acqua-Pruf, Inc., Bradley Beach, N. J., recommend an extra half-pint of the compound. Below 20 degrees the aggregates and water should be heated and any exposed surface protected, and in all cases the aggregates should be free of frost.

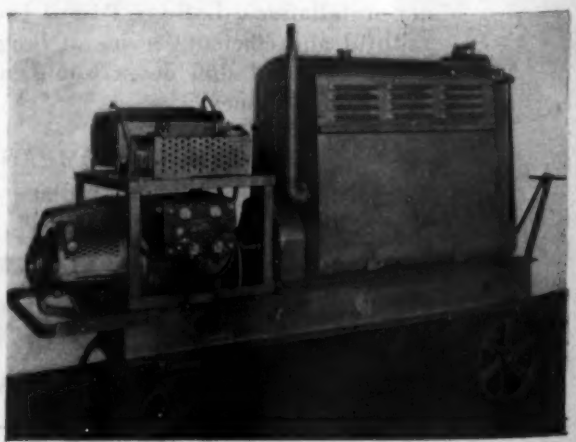
This compound takes the place of lime in making a fat mortar and also permits the concrete to flow more readily without the use of extra water. The manufacturers guarantee that Acqua-Pruf contains no acids or other elements in a form that will attack reinforcing. In fact, a piece of blue litmus paper shows no acid reaction upon being immersed in the compound. It contains no magnesium chloride or plaster of paris and is a permanent compound not deteriorating in storage.

New Portable Arc Welder Driven by 6-Cylinder Gas Engine

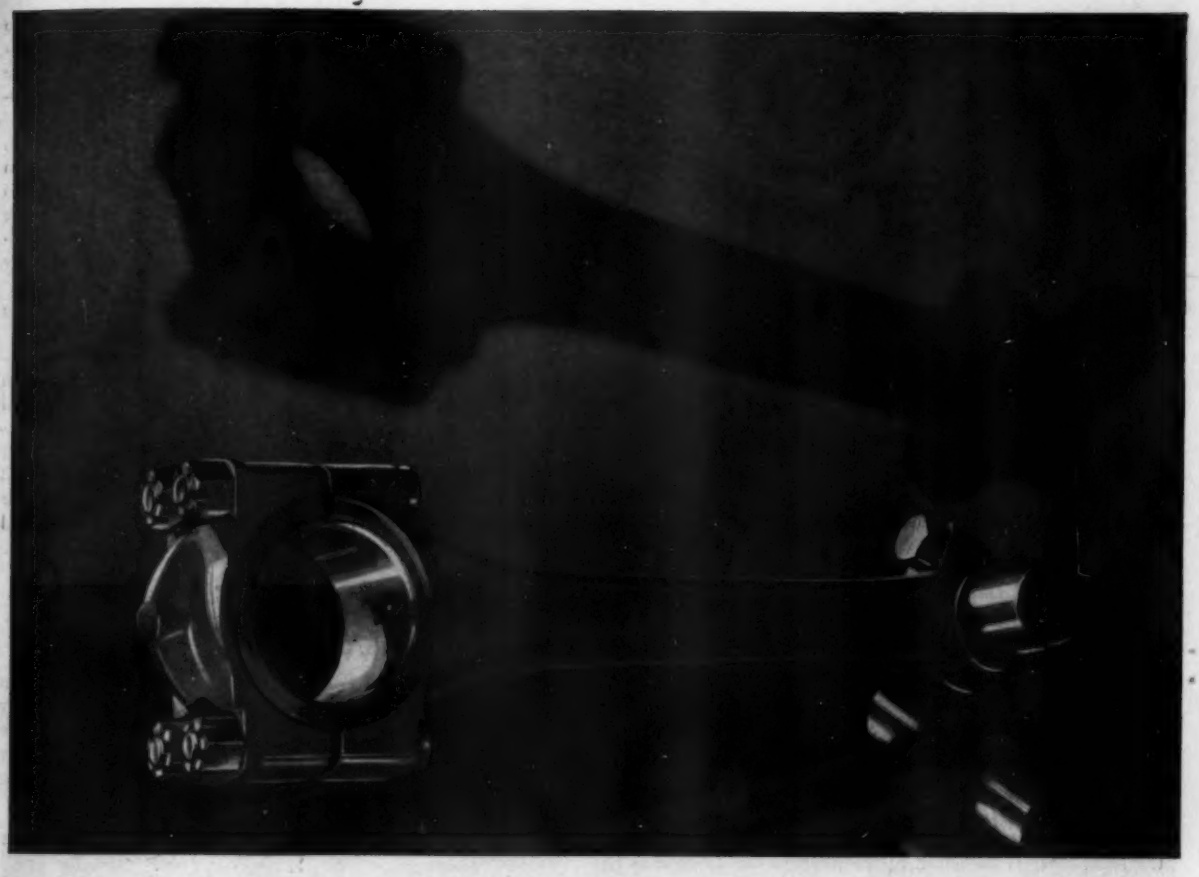
A NEW portable electric arc welding machine has recently been announced by the General Electric Co., Schenectady, N. Y. This welder is driven by a 6-cylinder gas engine and replaces the 4-cylinder engine driven unit previously included in that company's line. The new engine is the Buda Model HS-6 power unit built for industrial service. The cylinder head is a 4-cycle L-type. The bore is 3⅜ inches and the stroke, 4½ inches. The S. A. E. horsepower rating is 27.3 and the actual brake horsepower is 39 at 1,440 rpm. The engine is totally enclosed in a sheet metal housing. It is equipped with a radiator of strong construction, centrifugal water pump, United centrifugal-type air cleaner, Eisemann high-tension magneto with impulse starter coupling, gravity-fed Zenith carburetor with choke control, speed-regulating governor, gas tank of 10 gallons capacity, starting crank, oil gage and oil-pressure gage.

The welding generator is a ball-bearing, self-excited single-operator machine. Included with the set is a current-reducing resistor by means of which welding currents down to 25 amperes may be obtained. The current can be adjusted simply by turning the brush-shifting handle. When operating so that the potential at the generator panel, including reactor drop, is 25 volts, any value of current can be obtained between 25 and 400 amperes. A 500-ampere ammeter and a 120-volt voltmeter are mounted on the generator panel. A self-adjusting stabilizing reactor automatically steadies the arc. The automatic regulation is obtained by specially designed magnetic circuit without any moving parts.

The set is approximately 88 inches long, 32 inches wide and 69 inches high, the last dimensions including the running gear. The complete outfit is mounted on a welded structural steel base and may be made portable by the addition of running gear. Where used for outside work, a canopy can be provided to protect the generator from the weather.



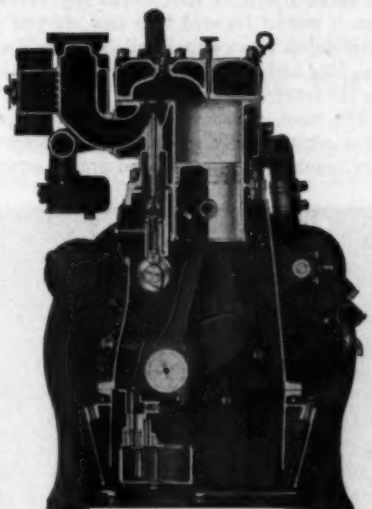
The New General Electric Portable Welding Unit



true character revealed

BEFORE any connecting rod is put into a Waukesha engine it is "right." After leaving the forge shop each rod is subjected to the *special deflection test.* Even the most minute defect, either in heat treatment or quality of material, cannot "get by." It was Waukesha engineering ingenuity that devised this simplest and most positive test. . . that definitely determines the fitness of a connecting rod to stand the stress of heavy duty in the modern industrial engine. *Waukesha connecting rods stand up.*

Bearing distortion is also eliminated. The reinforced connecting rod caps are heavily ribbed and held in place by four big, special heat treated bolts. Besides this great bearing stiffness, the large end of the connecting rod is ground to fit the removable bearing. Many other reasons for the long life of Waukesha engines are given in Bulletin 556. Write *Industrial Equipment Division, Waukesha Motor Company, Waukesha, Wisconsin. Offices: New York, 8 West 40th Street; San Francisco, 7 Front Street.*



Cross Section of 4-Cylinder Super-Duty Waukesha Engine

978

WAUKESHA ENGINES

Front View of the Cutting Head of the App Tunneling Machine

The Work of a Tunneling Machine

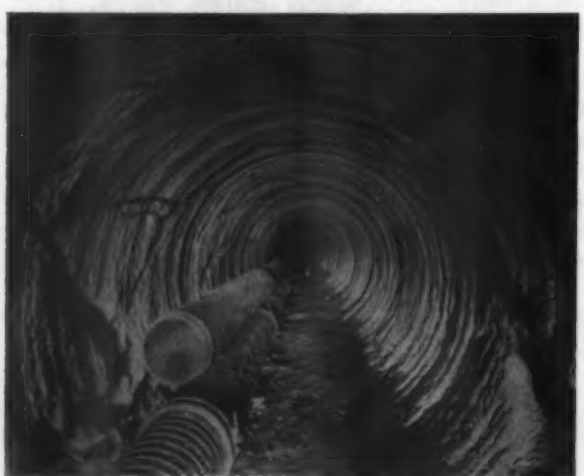
A TUNNELING machine which has for its primary purpose the facilitating of all sorts of underground work, such as the construction of subways, pilot tunnels for subways, water and sewage tunnels and other similar uses has been developed by the App Tunneling Machine Co., Inc., 1 Madison Ave., New York. This machine is approximately 7½ feet in height, 20 feet long and weighs about 18 tons. The machine chips away the rock by the action of a number of pneumatic hammers with chisels mounted on the head which turns on a longitudinal axis. When a chisel is not bearing on the rock, there is no action of the hammer but as soon as the tool contacts with the rock face the hammer operates.

The carriage of the machine consists of two parts. They are the front and rear halves through both of which the main shaft extends, the front carrying the revolving head which is moved forward 1, 2 or 3 inches per revolution. After the head has advanced 5 feet the feed screws are reversed and the rear section is moved forward to a new starting position. The main shaft which rotates the head is 12 inches in diameter and 20 feet long and extends the full length of the machine, connecting the front and rear parts.

The head, which is the tool carrier, comprises a hub and three arms, equally spaced apart. The arms carry the necessary number of hammers and are so arranged that the chisels cut in concentric circles. The power to rotate the head and to manipulate the machine, work the hammers, advance the machine and reverse the head, is entirely by compressed air. The feature of these hammers is the fact that their action is automatically controlled by the resistance of the rock or soil.

The point of control is where the chisel touches the rock. Where there is no contact, the hammer does not act but as soon as the chisel finds sufficient resistance, the hammers begin to work. The harder the rock the more powerful and the more rapidly the blows are delivered. Each hammer acts independently and as the revolving head advances all the hammers may be working at once or one only may be in action for a time. The entire operation of the machine is automatic from the breaking down of the material to its delivery in cars.

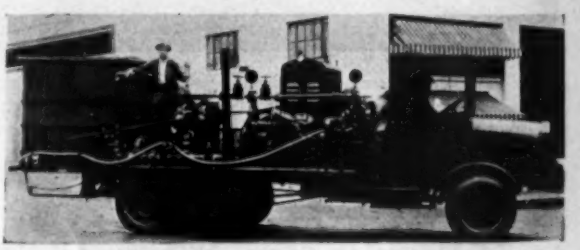
The machine has a mucker underneath the head for the removal of all cut material to a belt which runs the full length of the machine toward the rear and delivers the cut material to the disposal cars. The entire machine is made rigid by locking to the roof and floor of the tunnel under construction. It cuts a smooth bore exactly to the line carrying a cone shaped heading and on its forward movement is carried on crawler treads, so constructed for this machine that it may be turned within a radius of 60 feet.



A Tunnel 100 Inches in Diameter Cut Through a Mountain by the App Tunneling Machine

A New Type of Drive for Six-Wheel Truck

A NEW six-wheel truck that is a distinct departure from the usual method of applying the power to the rear axles has been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. The driving force on this new FWD truck is applied to the front and first rear axles through a center differential located in the subtransmission. The center differential compensates for the difference in distance traveled by the two sets of driving wheels such as occurs when turning corners or passing over uneven ground.



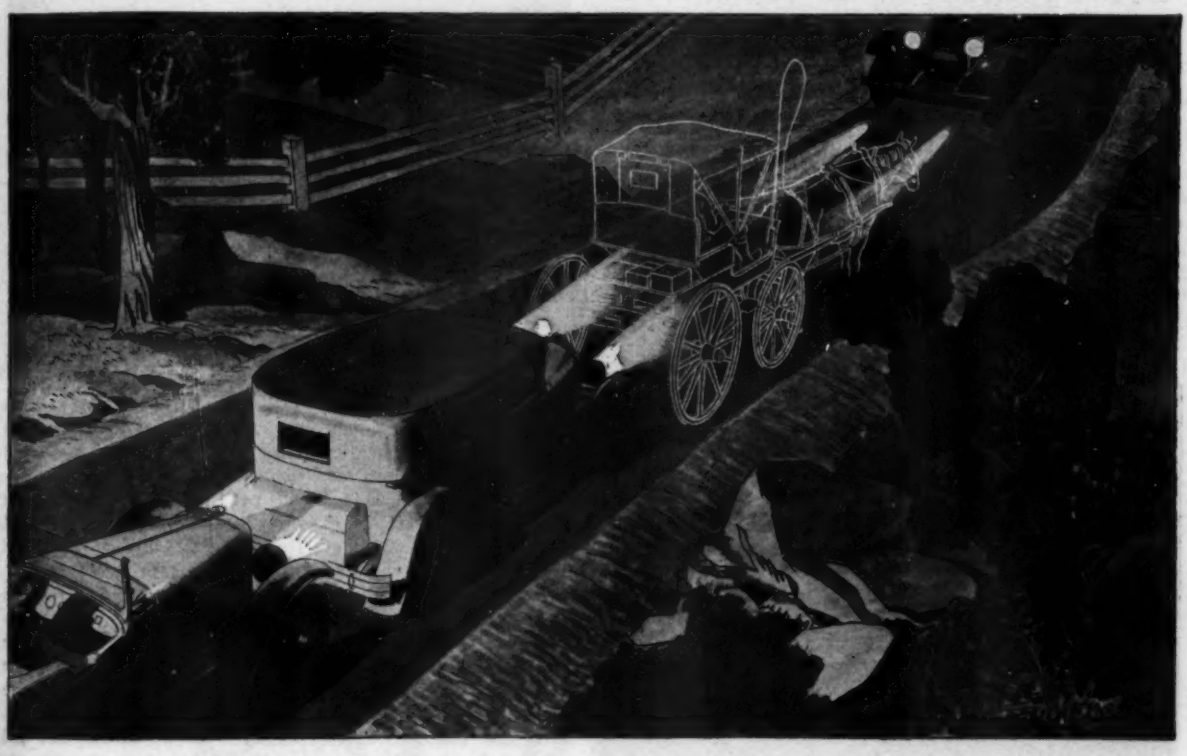
A Heavy Grouting Outfit Mounted on a 6-Wheel Drive FWD Truck

Suspension of the two rear axles is obtained by two inverted semi-elliptic springs on each side of the frame. Each spring is 44 inches long, made up of 11 leaves 3 inches wide. One of the springs is located above and one below the pivot and are clamped to the fulcrum bracket by bolts. The fulcrum brackets are pivoted on a solid steel shaft which forms a cross shaft below the frame. The cross shaft in turn is rigidly secured to the frame by two heavy steel brackets. The axles are fastened to the outer ends of the springs by means of a ball and socket joint, the spherical shaped spring mounting bearings on the first steel axle housing forming the ball portion of the ball and socket spring mounting. This spring suspension permits a certain amount of side float and flexibility without distortion of the springs or the frame of the truck.

The unit is powered by a six-cylinder, seven-bearing crank shaft engine of 87 horsepower. The transmission is of the individual clutch type with five speeds forward and one reverse. Five different gear ratios are available and by using the proper one, the truck is able to handle work from fast, long distance transportation to slow, heavy trucking.

The service or foot brake operates on the four wheels of

The next step..Roads *wide* enough



THE hundreds of thousands of miles of busy highways which need widening and rejuvenating constitute America's most pressing highway problem.

Wider pavements are much safer. And much more economical, not only because they accommodate more traffic but also because the traffic is distributed more evenly and wear is lessened. A 40-foot road will have more than twice the capacity of a 20-foot road—3,000 as against 1,400 vehicles per hour.

In any widening or rejuvenating project Tarvia is bound to play an important part. With Tarvia, old narrow roads can easily be transformed into durable, easy-riding, traffic-safe highways with a minimum of inconvenience to the traveling public—and at only a fraction of the cost of new construction.

The Tarvia field man will gladly give you further details. 'Phone, wire or write our nearest office.

The Barrett Company

New York	Chicago	Philadelphia
St. Louis	Minneapolis	Boston
Detroit	Cleveland	Birmingham
Buffalo	Kansas City	Columbus
Providence	Syracuse	Milwaukee
Baltimore	Toledo	Cincinnati
Lebanon	Youngstown	Rochester
		Bethlehem

In Canada:
THE BARRETT COMPANY, Ltd.
Montreal, Toronto, Winnipeg, Vancouver

Tarvia "RE-TREAD"

TRADE MARK REG. U. S. PAT. OFF.

the front and first rear axles from a single brake drum on the transmission main shaft. The emergency or hand brake operates on the four rear wheels and is of the internal expanding type with a drum 18 inches in diameter and 3½ inches wide. Two separate and independent sets of four-wheel brakes are provided that are positive in all positions of the wheels.

The front axle used in this six-wheeler is the same as that used in the FWD 5-ton type models. Its principle features consist of a patented steering knuckle called the ball and socket which permit the front wheels to be steered while power is being applied to them.

A Portable Trash Pump

A NEW portable trash pump designed for the economical handling of fluids containing large solids and much foreign matter, and particularly material of fibrous or stringy character, such as is found in sewage, has been brought out by Fairbanks, Morse & Co., Chicago, Ill., in conjunction with the C. H. & E. Manufacturing Co., of Milwaukee, Wis. These units consist of a Fairbanks-Morse trash pump with a C H & E drive mounted on a single frame as a compact, portable machine.

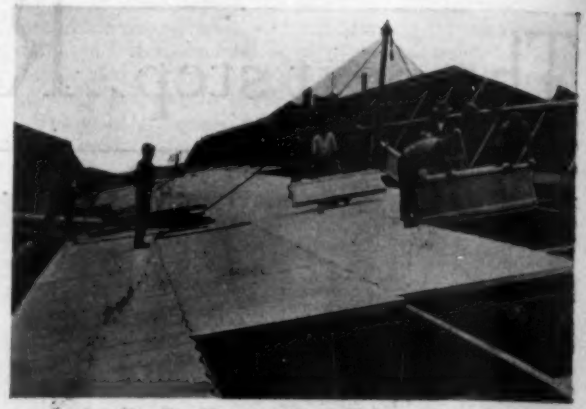
The Fairbanks-Morse Pump Mounted on a Truck Body

Several types of mountings are available, including the platform, as shown in the illustration, for mounting on a truck body, a simple steel skid or a trailer truck with either steel or rubber-tired wheels and with or without spring suspension.

These pumps are designed to handle solid spheres as large in diameter as the pipe size next smaller than the suction connections. The impeller will pass anything that will enter the suction nozzle through a right angle bend. In construction and drainage service they may be used to advantage where the water to be pumped contains rubbish, roots, sod, weed or other objects which would clog an ordinary centrifugal pump.

One of the features of the C H & E portable unit is the use of a simple and effective priming device, consisting of a small brass vacuum pump which is driven by friction from the flywheel of the engine. It is connected to the highest point of the pump shell and exhausts the air from the pump and hoist. After the pump is primed, the vacuum pump is thrown out of contact with the flywheel and does not run when the pump is working.

It is felt that these portable trash pumps will solve a troublesome problem not only for the sewage and water departments of cities, but also for the contractor who must pump water containing considerable foreign matter from footings, foundations, ditches, tunnels, cofferdams, sumps and manholes. Shutdowns to take off the hose or take the pump apart to clean the impeller are avoided. A single bar across the intake to keep out debris that might get stuck crosswise in the hose is all that is necessary.



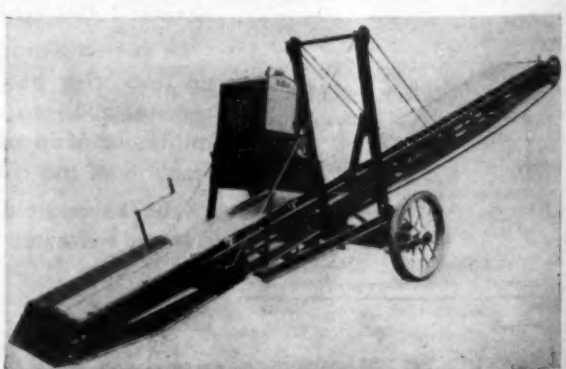
Laying Haydite Concrete Roof Slabs on Steel Purlins

Concrete Roof-Decking

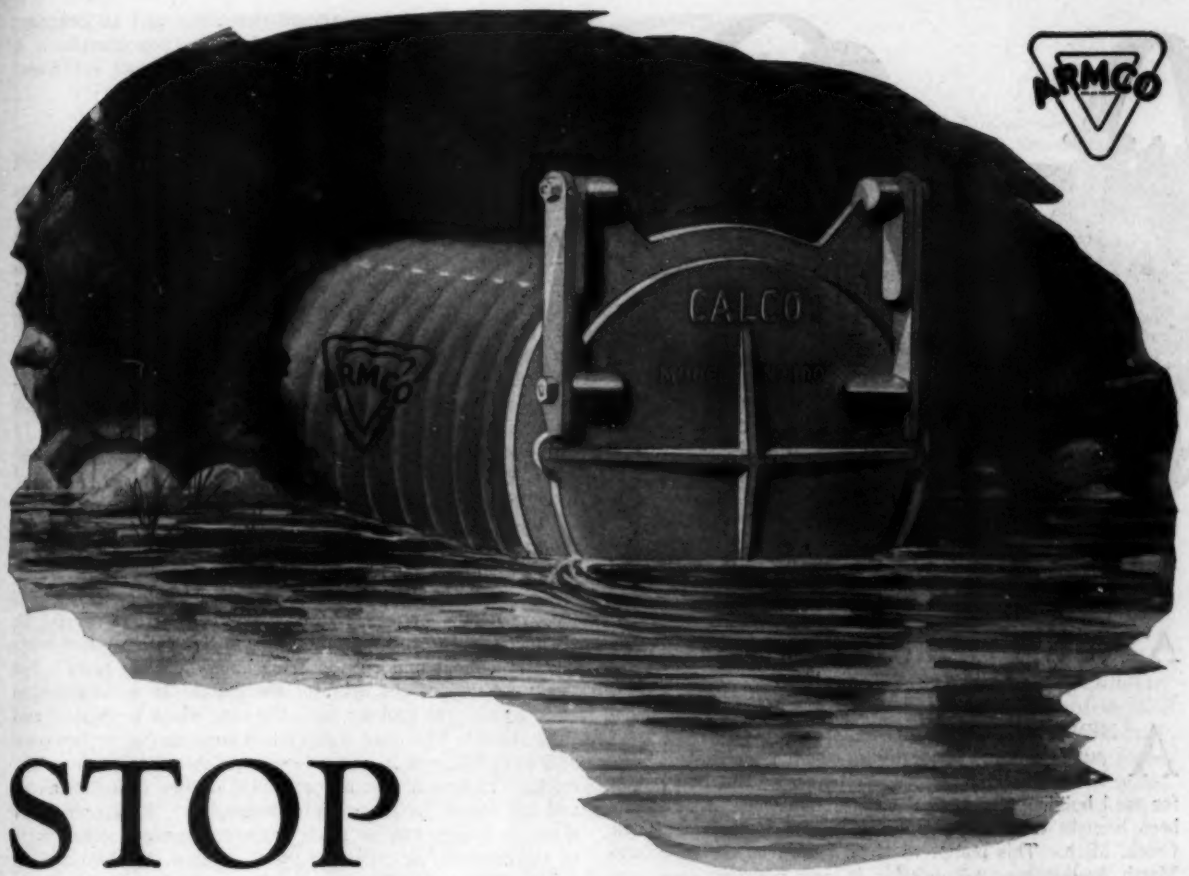
ROOF slabs have been precast of concrete and used extensively for permanent, fireproof and non-maintenance roof-decks for many years on all kinds of buildings. Since they are laid directly on the steel roof purlins to form the roof-deck, their weight is naturally an important factor in determining the amount and cost of the structural steel used to support the roof. A sand concrete slab of this kind in channel form would weigh 15 pounds per square foot. Slabs made of Haydite concrete, by the process developed by the Federal Cement Tile Co., 608 South Dearborn St., Chicago, Ill., would weigh 10 pounds per square foot or one-third less.

When shale is ground and burned under careful control at a temperature of about 2,000 degrees in rotary kilns, the oxidation of the carbon content forms gases and causes the shale to expand into an inert, light weight cellular structure. The result is a mass of trapped air cells, the walls of which are thoroughly vitrified, fused shale, impervious and of great structural strength. This material is known as Haydite and when it is crushed, screened and graded, it is used as an aggregate instead of sand or stone, to produce Haydite concrete. Two advantages of the trapped air cells in this material are that the concrete becomes very much lighter while at the same time retaining the same structural strength, and it possesses an insulating value unobtainable in ordinary concrete.

This material is made into slabs, about 6 x 2 feet, which are laid directly on the steel purlins for roofing. For extreme conditions of heat and humidity an extra layer of insulating material may be laid over the Haydite concrete roof-deck but for most purposes this is unnecessary. Roof-decks of these slabs have been used for factories and public buildings.



One of the Fairfield Portable Conveyors 25 Feet Long, with 24-Inch Belt Purchased by the Ohio State Highway Department for Unloading Aggregate Direct from Hopper Bottom Cars to Trucks



STOP BACK FLOW

WHERE flood or tide water or other abnormal conditions reverse the direction of flow—specify Calco Gates.

Placed at the discharge end of the pipe, Calco Gates are a quick-acting and unfailing safeguard against back flow. Yet they in no wise retard the continuous flow of drainage as long as it is in the right direction.

Calco Gates are available in sizes from 8 to 84 inches and are made to fit Armco Corrugated Iron Pipe, to which they are quickly attached. A bulletin covering all details is ready. Let us send it at once. Write us.

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio

ARMCO *Corrugated Iron Pipe* WITH **CALCO** *Automatic Drainage Gate*

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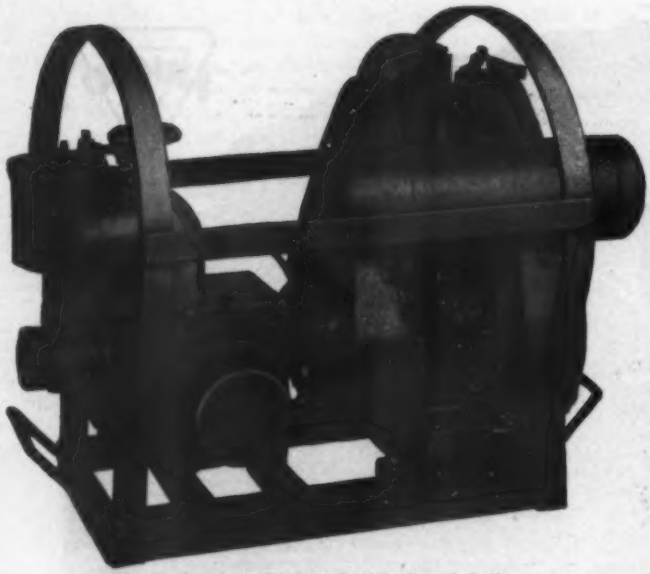


The Redi-Prime Equipped with Guard Rails

A New Portable Centrifugal Pump

A NEW portable centrifugal pump which can be used for pumping from excavations, conduit tunnels or manholes, pumping on scows or barges or supplying water for road building and general construction work, has recently been brought out by the American Steam Pump Co., Battle Creek, Mich. This pump, which is known as the American-Marsh Redi-Prime, will operate in any position, even suspended by rope or chain or on the running board of an automobile, requiring no foundation, skids or blocks. The three-point suspension eliminates vibration and tendency to crawl.

This pump has a dry system of priming, eliminating the need for pouring water into the pump to start it and removing the chance of freezing in cold weather. A small rotary air pump, driven by a worm gear from the centrifugal pump shaft, produces a positive vacuum in the centrifugal pump casing as soon as the engine is started. This air pump runs in a bath of oil and it out of contact with the water entirely, due to the patented Barton primer. When the centrifugal pump is primed the air pump may be shut off by means of a hand lever.

In place of packing in the stuffing box, a patented seal ring is provided. The engine is a Basco 4-cycle engine, rates at ¾-horsepower at 1,800 rpm, which starts easily under all conditions and has a positive system of lubrication. It is air-cooled by a dual blast from the flywheel blowers and extra large cooling fins on the cylinder. For 10 hours' continuous operation only ¾-gallon of gasoline is required.

The weight of the complete outfit is 115 pounds, so that one man can lift and carry it easily by the conveniently placed handles. The space required for the pump is only 23 x 11 x 15 inches. If desired, rail guards can be furnished to protect all parts from damage through accident.

The Redi-Prime pump will handle anything that passes the strainer, including clean water, hot or cold, muddy or gritty water, oil or gasoline. The special open-type bronze propeller will pass solids up to ½ inch in diameter without difficulty. Water can be lifted 22 feet by suction and pumped against heads up to 35 feet. It has a 2-inch suction equipped with 2-inch straight iron male pipe threads which fits standard hose unions. The 2-inch discharge is provided with an adjustable rubber seated check and shut-off valve tapped for a standard 2-inch pipe.

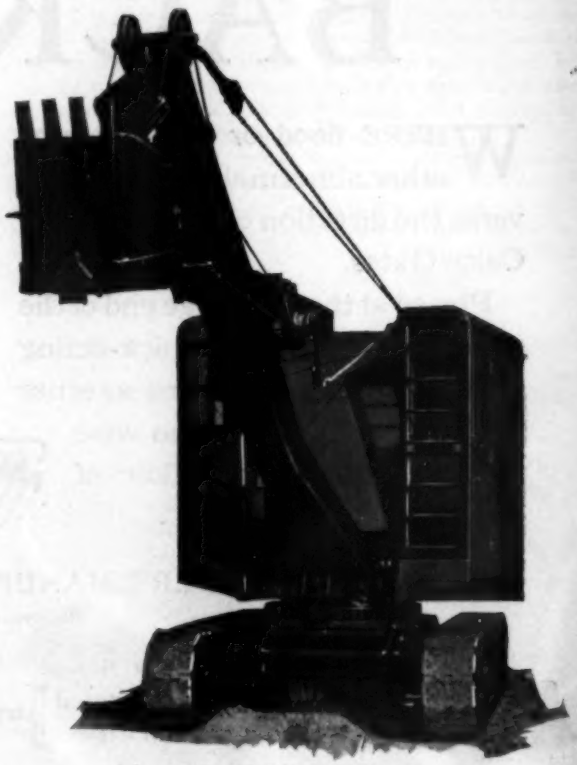
The pump casing is built from special wear-resisting cast iron which offers maximum durability, and all bearings, rotary air pump, friction clutch and stuffing box operates in a bath of oil, requiring no attention other than an occasional addition of oil to the one main oil reservoir.

Full Revolving Crawler Type Shovel

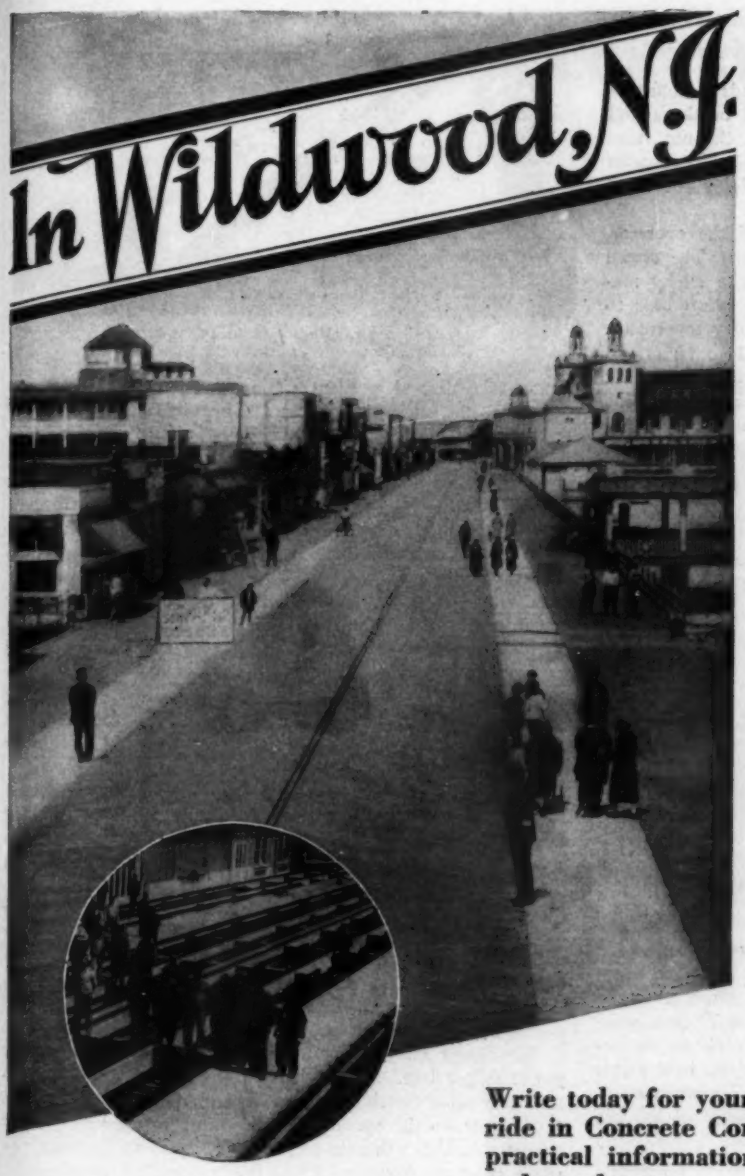
A FULL-REVOLVING crawler-type machine known as Model TS and which may be used as shovel, crane, dragline or trench hoe, has recently been put on the market by the Ohio Locomotive Crane Co., Bucyrus, Ohio. All major parts of the machine are cast steel, including the carbody, machinery base, the one-piece side frames, treaside frames and dipper back. The 16-foot, one-piece solid box boom has no opening through the center, thus giving strength at the shipper shaft. The dipper handle is 11 feet, 6 inches in length with one-piece steel cut tooth rack. The dipper has a capacity of ⅜-yard struck measure and special alloy teeth which can be adjusted to different angles. There are adjustable blocks in the dipper stick guide to take up for wear. The sheaves on the end of the boom are 12 inches in diameter and take ⅝-inch diameter cable.

The power plant is an International 30.4-horsepower at 1,000 rpm., having three speeds forward and one reverse on all operations. The machine is equipped with bronze bearings throughout and cut-tooth machinery driving gears. For the protection of the operator the motor fan is so arranged as to extract the foul air from the cab, which is all steel and fully closed. The large high carbon steel shafts are equipped with keys sufficient in size to overcome shearing stresses. The internal expansion clutches are 18½ inches inside diameter and all clutch parts are interchangeable. Replacement of shoes or linings can be made without disturbing other parts of the assembly or removing the shaft from the bearings.

The lower propelling mechanism is equipped with interchangeable split bronze bearings allowing field replacements



The Model TS Full-Revolving Shovel



Shown here under construction and as completed is the famous reinforced concrete boardwalk of this well-known summer resort, which was finished ahead of schedule time through the use of Solvay Calcium Chloride.

The following letter is from the engineers and contractors on this job:

Solvay Sales Corporation
40 Rector Street, New York

Gentlemen:

On the Wildwood Reinforced Concrete Boardwalk Solvay Calcium Chloride enabled us to complete this job three weeks ahead of schedule which meant a great deal to the local resort, since the boardwalk is its main source of revenue in the summer time.

Yours very truly,
F. W. SCHWIERS JR. CO.
(*Signed*) William Schwiers

Write today for your copy of "Solvay Calcium Chloride in Concrete Construction," which contains full practical information about this ideal curing agent and accelerator.

Ask for Booklet 2053

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 Rector Street **New York**

SOLVAY

TRADE MARK REG. U. S. PAT. OFF.

Calcium Chloride

Flake 77%-80%

Manufactured under United States Patents No. 1,527,121 *and No.* 1,592,971

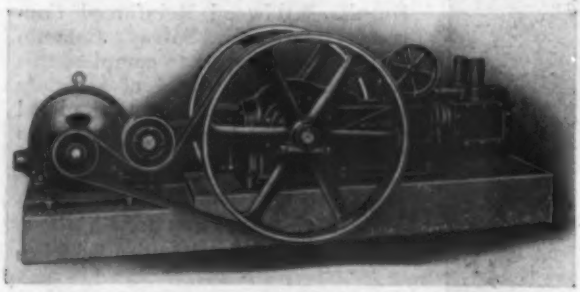
with minimum loss of time. The mechanism functions through three separate shafts to eliminate the twisting action when the brake is applied on one side.

The adjustment of the treads from both ends is sufficient to allow the removal of one shoe in case of breakage and bronze adjusting screws in the treads prevent the nut from rusting tight to the screw. The machine is equipped with brakes and separate braking mechanism for holding one tread in making short turns.

All controls are within convenient reach of the operator, allowing maximum output with the least effort. The crowd has power operation in both directions to shake sticky material from the bucket by the chain from the boom base to the shipper shaft. No other chain is used above the treads. The gas consumption of this shovel is from 12 to 15 gallons per day. The machine is convertible to a crane by removing the crowd shaft from the bearings and replacing it with the drum shaft furnished with the crane equipment.

New Line of Compressors

A NEW line of compressors employing Timken roller bearings on the main crankshaft journals has been announced by the Worthington Pump & Machinery Corp., Harrison, N. J. This is the Worthington single, horizontal, straight-line series with a range from 100 to 300 cubic feet per minute.



One of the New Line of Worthington Compressors

Oil rings which deflect the surplus oil and return it to the crankcase are mounted on the shaft beyond the Timken bearings. A special feature is the design of the crankcase enclosure which is completely oil-tight. Feather valves, light strips of steel approximately 1/32-inch thick which flex when opening against a curved guard to permit the passage of air, are standard equipment on these compressors.

Regulation may be by an automatic starter and pressure switch mounted on the motor, stopping and starting it to control the air pressure between definite limits. A pressure regulator may be attached to the compressor inlet valves holding them open to maintain constant air pressure.

These compressors can be furnished with ball-bearing idlers for a short belt drive, with Texrope drives using V-type ropes or a synchronous motor may be directly mounted on the compressor crankshaft, thus eliminating transmission mechanism.

A ¾-Yard Shovel, Crane, Clamshell and Dragline

THE Lorain-45, a new ¾-yard shovel, crane, clamshell and dragline, has recently been announced by the Thew Shovel Co., Lorain, Ohio, supplementing its present line, the 1-yard and 1¼-yard shovels. The basic design and construction principles of these shovels have been incorporated into the new Lorain-45 which is built to the Thew center drive design in turntable, truck and shovel boom.

The superstructure or turntable is powered by a Waukesha type H. L. motor with 6-inch bore, 6½-inch stroke, developing 71 horsepower. The power transmission consists of a

The New Lorain-45

power take-off and a silent chain drive carrying the power directly to the center drive pinion. This pinion meshes directly with the three power shafts, the hoist, swing and crowd or travel shafts, and constitutes the entire power transmission. Each of these three power shafts is independently controlled through a large internal expanding band clutch. Each shaft may be separately engaged with the full power of the motor applied to it, or all of these shafts may be engaged for simultaneous operations.

This superstructure is mounted on a 2-speed Thew center drive crawler, similar to the Lorain-75 mounting but modified for the ¾-yard capacity. A vertical travel shaft and a horizontal propelling shaft comprise the major crawler drive. All the propelling gears and steering clutches run in a constant oil bath in a heavy steel crankcase placed high to afford generous ground clearances. The steering clutches of the crawler are mounted on splined shaft sections.

Crawler high travel speed is 1½ miles per hour, climbing a 15 per cent grade and low speed is ¾-mile per hour, climbing a 30 per cent grade. Both speeds are available for travel in either direction with equal efficiency, regardless of the length of travel.

The shovel boom is the Thew center drive type in which the shipper shaft is placed at the center of the boom, or further ahead and in a lower position, permitting the dipper stick to attain a greater vertical angle. It is an all-steel full box-section boom of great strength. The dipper stick is an all-steel welded rectangular section with a far-reach greenhorn at one end.

The dipper on the Lorain-45 is tripped by an automatic power dipper trip. This is located on the turntable and consists of a small clutch device on the end of the swing shaft. A small lever, to the operator's right, when engaged by a slight pressure, actuates this device, causing a pull on the trip rope which trips the dipper once and then returns to position.

The crane, clamshell and dragline booms are all steel, latticed booms built in two sections with interchangeable boom heads. The standard boom is 35 feet long, although various lengths of boom head sections and middle sections can be furnished for longer booms.

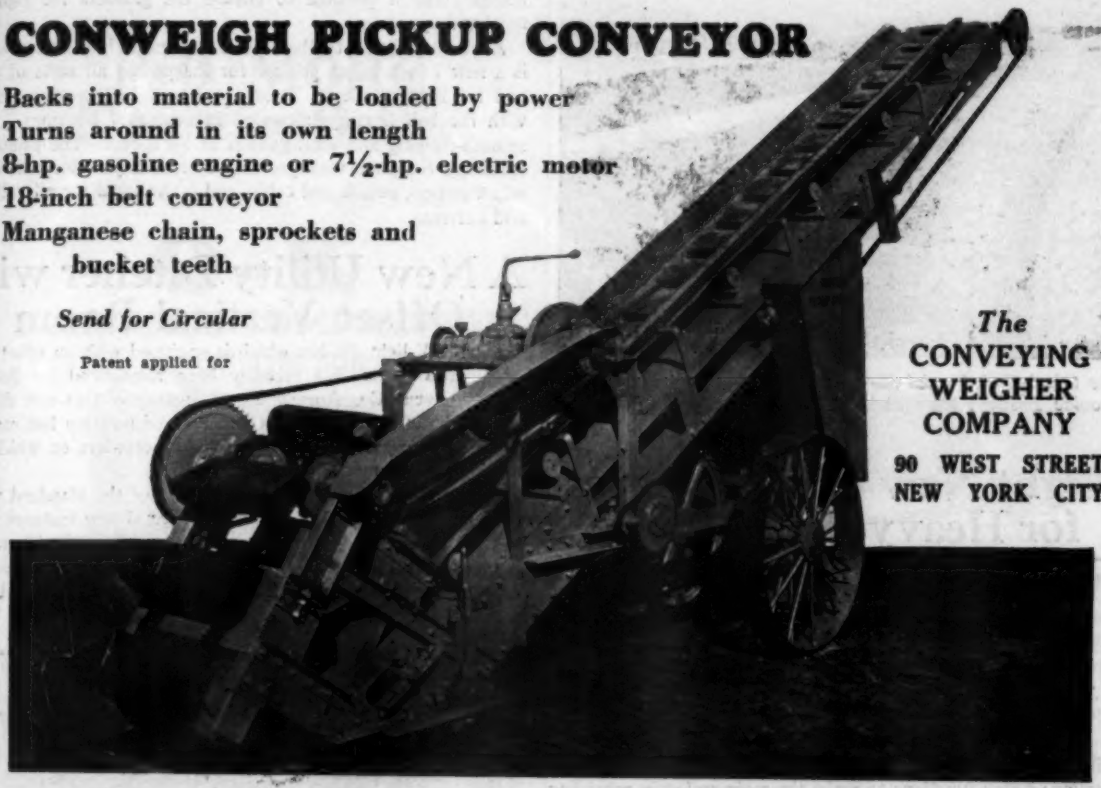
Chevrolet Utility Chassis Equipped with an Anthony Rotating Motor-Driven Power Hoist Body

CONWEIGH PICKUP CONVEYOR

Backs into material to be loaded by power
Turns around in its own length
8-hp. gasoline engine or 7½-hp. electric motor
18-inch belt conveyor
Manganese chain, sprockets and bucket teeth

Send for Circular

Patent applied for



The
CONVEYING WEIGHER COMPANY
90 WEST STREET
NEW YORK CITY

Shipped last night. Started this morning. Water instantly — no priming. That's typical Homelite performance for the portable centrifugal pump that primes itself.

Capacity 6000 gallons per hr. . . . or a mere dribble, if that's all there is in the hole.

Portable by one man. Weighs less than 100 lbs. with built-in Homelite air cooled gasoline engine.

Try one. Distributors throughout the world for demonstration and service. Write for the address of the nearest.

See our exhibits Good Roads Show, Atlantic City, January 11 to 17, 1930.

HOMELITE CORPORATION
71 Riverdale Ave., Port Chester, N. Y.

HOMELITE
Self priming
Portable Centrifugal Pump Ⓟ 3741

The GMC T-60 Special Showing the Auxiliary Springs Which Provide Easier Riding and Add to the Spring Stiffness and Stability

Eight New Chassis Types for Heavy-Duty Truck

EIGHT special new chassis types, with increased capacity, have been announced by General Motors Truck Co., Pontiac, Mich., for use with its GMC truck Model T-60. The new types are known as T-60 specials and have capacities ranging up to 22,000 pounds, total allowable gross weights.

Among the features of these new chassis are heavier worm drive rear axles, two-stage rear springs and larger tires. The two-stage type rear springs, main and auxiliary, provide easy riding under light load conditions, and during heavy loads the auxiliary spring functions to assist the main spring in providing increased stiffness. The addition of the auxiliary spring assists in counteracting objectionable side-sway or leaning when going around curves or on unlevel road conditions. There are three optional gear ratios and four chassis lengths, built in eight types, are available.

Electric Grinders for Contractors' Use

A NEW 7-inch Flex-Disc electric grinder for use in smoothing welded and soldered joints and seams, cleaning dies, smoothing metal surfaces before painting and any other work requiring filing, sanding or emerying has recently been announced by the Van Dorn Electric Tool Co., Cleveland, Ohio. This grinder has ample power, and with the use of a felt backed abrasive disc handles operations easily and quickly. A removable pipe handle and right and left-hand bosses make it possible to change the grinders for right or left-hand operation.

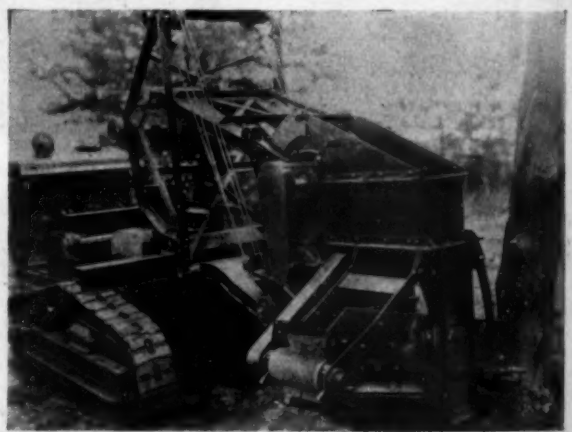
The Van Dorn Flex Disc Grinder

Another addition to the Van Dorn line of portable grinders is a new 7-inch bench grinder for sharpening all sorts of tools and for light grinding. It is a compact ball bearing grinder with the ball bearings mounted in dustproof housings. It is smooth-running and vibrationless at all speeds. The grinder is furnished complete with grinding wheels, adjustable tool rests, wheel guards, switch and cable, and is available for all voltages and currents.

A New Utility Ditcher with Offset Vertical Boom

A NEW light ditcher which is equipped with an offset vertical boom has recently been announced by Barber-Greene Co., Aurora, Ill. A feature of this new ditcher is that the offset boom is not in any fixed position but may be set at any desired position between the crawlers on which the machine is mounted and locked there.

This ditcher is patterned generally after the standard vertical boom ditcher but has in addition several new features. The vertical boom which is an innovation on a light ditcher makes it possible to dig directly up to any object such as a sidewalk or curb, ending the trench flush and leaving no ramp to be removed by shovel labor.



The New Barber-Greene Utility Ditcher Showing How Close the Ditcher Can Work to an Object

In addition to being vertical, the boom on the utility ditcher may be easily offset 13½ inches to either side of the center by means of a ratchet and screw. With the boom offset, the ditcher can dig to within 15 inches of any obstruction.

Another feature is the automatic overload safety sprocket. This affords protection for the machine against overloads, and for pipe and other underground installations against breakage. When an obstruction is encountered, the sprocket slips, stopping the bucket line, catches every half revolution and then slips again. The boom is raised and lowered by power and an automatic throw-out prevents raising the boom too high.

The whole machine is mounted on sturdy crawlers of standard B-G design by means of a fixed and an oscillating axle. The oscillating axle provides three-point suspension which enables it to ride over rough ground and remain even.

Power is provided by a Buda 38-horsepower gasoline engine through two especially designed transmissions. The ditcher has four road speeds, three forward and one reverse, with a high forward speed of 2 1/3 miles per hour, and a number of digging speeds ranging from 12 inches to 148 inches per minute. It cuts a trench from 9 to 18 inches wide and from 4 to 5 feet 6 inches deep.

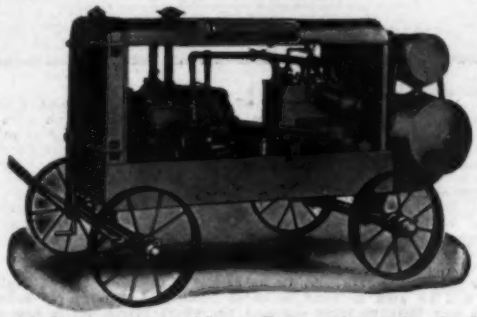
No More Operating Delays

Mr. Contractor—when an

O-K

PORTABLE COMPRESSOR

IS ON THE JOB



Furnished in two sizes; with piston displacements of 120, and 240 cubic feet of free air.

Free running engine clutch—balanced crankshaft—force-feed oiling system.

O. K. CLUTCH & MACHINERY CO.
COLUMBIA PENNSYLVANIA

Rugged-Reliable

Schaefer CLEVELAND

THE LEADING ONE-MAN TRACTOR SCRAPER

Write for our circulars

THE SCHAEFER One-Man Tractor Scraper has attained a prominent place in the contracting field because of the simple and easy way to which it moves earth at very LOW COST. It loads, dumps, spreads and levels—all operations are controlled from the tractor seat. It will pay you to investigate this scraper. Scrapers are furnished in 4-, 5-, 6- and 7-foot widths.

The Gustav Schaefer Company
4180 LORAIN AVE. CLEVELAND, OHIO

BUFFALO—SPRINGFIELD ROAD ROLLERS

Ability to lead means the possession of those qualities that men recognize as superior. NOTHING ELSE makes leadership.

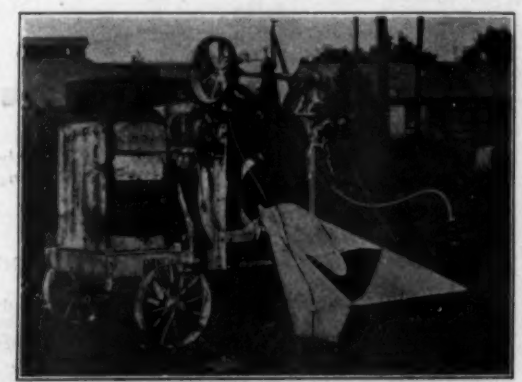
From coast to coast, wherever new roads are being made or present ones repaired, Buffalo-Springfield Road Rollers are the choice of the men on the job. Advanced design and superior performance make these rollers widely accepted as leaders worthy of the name.

Various steam and motor-driven designs in all practical sizes. Attachments when desired.

Interesting booklet on request.

THE BUFFALO-SPRINGFIELD ROLLER CO.
Springfield, Ohio

Warm Concrete With A Chausse Mixer Heater



Chausse concrete mixer heaters deliver a big, clean flame direct into the mixer drum where the contents are well heated during the mixing process. They enable contractors to pour concrete the year round. Made for drum and tilting type mixers and easily applied. Dependable and satisfactory.

Other products—Portable Asphalt Plants, Oil Burning Tar Kettles, Fire Wagons, Surface Heaters and Kerosene Torches.

Chausse Oil Burner Company
Elkhart Indiana

BAKER

BULLDOZERS

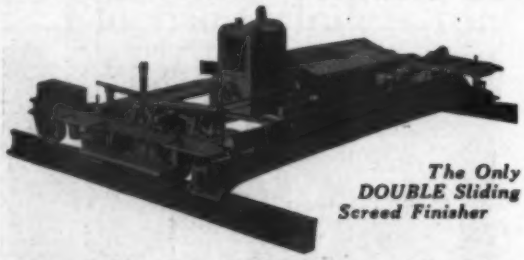
BAKER Hydraulic Bulldozers are easily operated, work well below track of tractor, lift higher and are built for the toughest jobs. Made in four models for "Caterpillar" and "Monarch" tractors.

Write for Special Bulletin Today

THE BAKER MANUFACTURING CO.

585 Stanford Ave. Springfield, Ill.

VIBRATIONLESS



The Only DOUBLE Sliding Screed Finisher

The ORD Road Finishing Machine

The front and rear screeds are the only working members of the ORD. The rest of the machine is for the sole purpose of making these screeds function *efficiently, smoothly and without vibration.*

A heavy, rigid carriage evenly balanced upon six wheels — four of them traction-geared and chain-driven; mounted on hinged trucks for even-bearing, non-load-shifting passage over road forms; and complete Alemite lubrication—are a few of the many features that prevent vibration.

Write today for our latest bulletin describing the ORD

A. W. FRENCH & CO.

DIVISION OF BLAW-KNOX CO.

Manufacturers of the ORD Concrete Road Finisher

Sales Dept., 122 So. Michigan Ave., Chicago, Ill.

CONTRACTORS USE THIS SERVICE

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

STEEL BARRICADE SUPPORTS

Cleveland Steel Specialty Co., 6602 Park Ave., Cleveland, Ohio, will send to those interested literature describing the Cleveland steel barricade supports which are 30 inches in height, for a 2 x 6 stringer, of rugged construction, self-locking, easily dismantled or set up by one man and heavy enough to withstand high wind pressure.

A NEW BOOM FOR USE WITH TRACTORS

W-K-M Co., Inc., Houston, Texas, will be glad to send a description of the W-K-M boom and material handling equipment for use with tractors and which are operated by the tractor power take-off.

A RIVET PIERCING TIP

The Alexander Milburn Co., 1416-28 Baltimore Street, Baltimore, Md., will be glad to send to those interested a complete description of the new Milburn rivet piercing tip which introduces a new method of consuming the head of the rivet and the body of the rivet by piercing the rivet body.

A NEW WATER CONTROL FOR PAVERS

Complete information in regard to the new water tank for pavers which controls the water to a fraction of a gallon under all conditions, automatically closes the supply valve and signals the operator when it is full and has a capacity of 46 pounds, may be secured by those interested from the Foote Co., Nunda, N. Y.

AN ELEVATING GRADER WITH POWER TAKE-OFF

Literature describing the new Russell Sixty elevating grader which is equipped with a new power take-off may be secured by those interested from the Caterpillar Tractor Co., San Leandro, Calif.

A SMALL AIR HAMMER

Catalog No. 124 "Pile Driving Machinery and Foundation Equipment" containing a description of the Union No. 9 Midget hammer which is designed to come within the weight range of the pavement breaker and the rock drill type of hammer, weighs 97 pounds, delivers over 250 blows per minute and strikes a 275-pound blow may be secured from Union Iron Works, West Shore Siding, Hoboken, N. J.

LOCOMOTIVES FOR GENERAL CONTRACTING PURPOSES

Folder C describing the 2 to 12-ton Brookville locomotives which are powered with truck and tractor power units, have the same speeds in both forward and reverse operations and which have steel tired drive wheels, will be sent to those interested by the Brookville Locomotive Co., Brookville, Pa.

READY-MIXED CONCRETE PLANTS AND BODIES

Bulletin No. 1114, containing complete information in regard to Blaw-Knox ready-mixed concrete plants for proportioning and mixing the concrete and agitator truck bodies for delivering the mixed concrete to the job, may be secured by those interested from the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa.

TWO NEW GRADERS

Bulletins W-29-D and W-29-J describing the new Western No. 55 road grader and the No. 22 leaning wheel grader for use in road construction and maintenance may be secured from the Austin-Western Road Machinery Co., 400 North Michigan Avenue, Chicago, Ill.

AN AIR CUSHION EXPANSION JOINT

The Truscon Steel Co., Youngstown, Ohio, has recently developed an air cushion expansion joint consisting essentially of metallic sides forming a free air space for expansion closed at the top by a bellows shaped piece of galvanized copper bearing steel to prevent dirt working into the joint from the top of the pavement.

A COMPLETE LINE OF PUMPS FOR CONTRACTORS' USE

C. H. & E. Manufacturing Co., 250 Mineral Street, Milwaukee, Wis., will be glad to send to those interested complete information in regard to its complete line of pumps for contractors' use, including mud-hen pumps, triplex, centrifugal, and sewage and trash pumps.

A CONVERTIBLE POWER SHOVEL

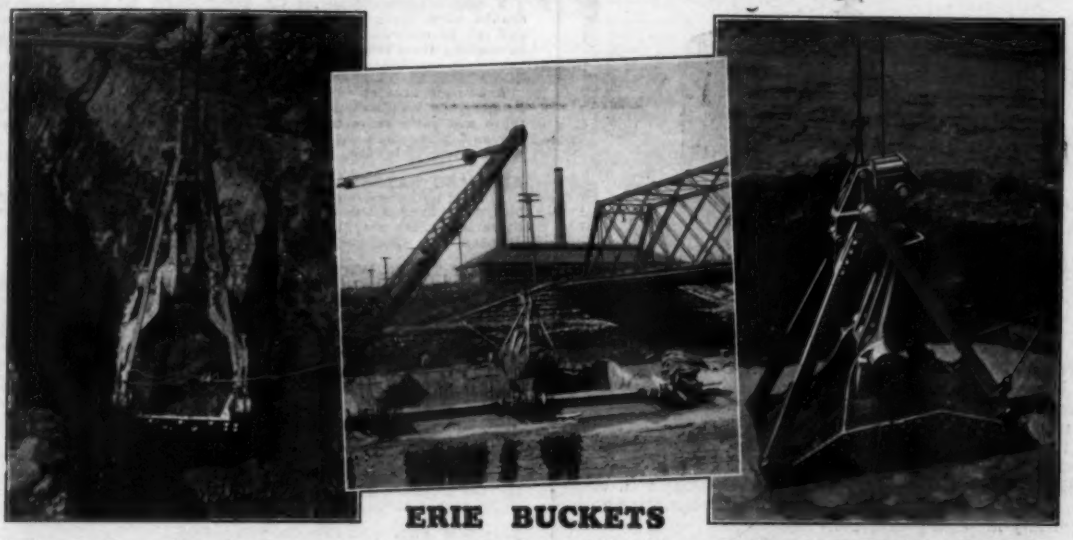
Information in regard to the Star convertible power shovel which may be used as a grader, ditcher, shovel, backfiller or crane, among the features of which is the Star telescoping handle, may be secured from the Star Drilling Machine Co., Akron, Ohio.

A NEW CONCRETE MIXER

Lansing's new 3½-T concrete mixer with Hyatt roller bearing wheels, wide tread rubber tires and spring shock absorbers, a large mixing drum with four steel blades and equipped for use as a trailer is described in literature which may be secured from Lansing Co., Lansing, Mich.

In CLEVELAND—

"Since putting your bucket on our crane we have added an extra truck to haul the dirt away."



ERIE BUCKETS

That is what one contractor said about the ERIE bucket.

Remember our bucket will dig as well or better than any bucket of equal weight and parts of line.
Let us prove it. Send for the complete story.

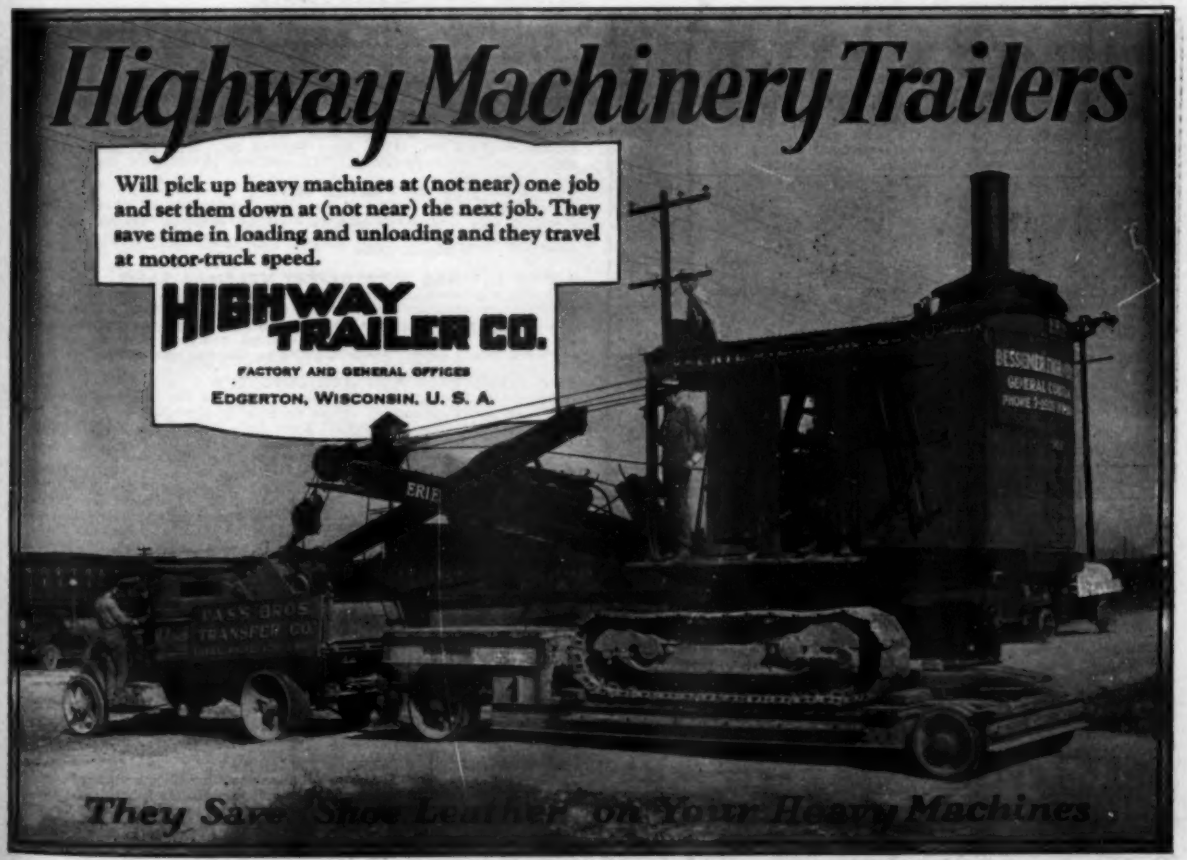
ERIE STEEL CONSTRUCTION CO., ERIE, PENNA.

Highway Machinery Trailers

Will pick up heavy machines at (not near) one job and set them down at (not near) the next job. They save time in loading and unloading and they travel at motor-truck speed.

HIGHWAY TRAILER CO.

FACTORY AND GENERAL OFFICES
EDGERTON, WISCONSIN, U. S. A.



They Save Shoe Leather on Your Heavy Machines

GET THE FACTS ABOUT *Buhl* Compressors

INVESTIGATE the BUHL Portable Compressor because it is "Years Ahead" in design. It embodies many exclusive, patented improvements that result in unusual economy, dependability and long life. Many of the leading concerns in the country are enthusiastic users.

BUHL Portable Compressors are obtainable in *36, 55, 90, 100, 110, 220,* and *330* cubic feet capacities and with any mounting desired.

Descriptive Bulletins on Request

THE *Buhl* COMPANY

Old Colony Bldg., Chicago

Sales Branches in All Principal Cities

BROOKVILLE LOCOMOTIVES

(McCormick-Deering—International Power Units)

The Dravo Contracting Company of Pittsburgh, Pa., is now using this Model "IBY," 6-ton BROOKVILLE Locomotive on a large construction project. *Dependability, Speed* and *Power* coupled with *Economy* and *Versatility* make BROOKVILLE Locomotives unequalled for General Contracting, Road Building, Bridge and Dam Construction. Contractors everywhere are saving thousands of dollars yearly by using BROOKVILLE Locomotives on difficult jobs.

Consult us freely on your haulage problems. Expert advice cheerfully furnished.

BROOKVILLE LOCOMOTIVE CO.

Brookville, Pa.

Contractors—Use This Service

POWER-OPERATED HYDRAULIC HOIST FOR LIGHT TRUCK
A complete description of the Wood Model AP power-operated hydraulic hoist for a 1½-ton chassis, which dumps in 8 to 10 seconds, and can be controlled entirely without the driver leaving his seat, may be secured from the Wood Hydraulic Hoist & Body Co., Detroit, Mich.

COMMERCIAL EXPLOSIVES
A 44-page booklet entitled "Commercial Explosives: Their Safe and Proper Use," which contains definitions of explosives, lists the various types and their characteristics and offers directions for loading, priming and firing may be secured from the Hercules Powder Co., Inc., Wilmington, Delaware.

BINS AND BATCHERS
Volume and scale batchers, beam balance indicators and demountable bins as well as Johnson ready-mixed concrete plants are described in literature which may be obtained by those interested from the C. S. Johnson Co., Champaign, Ill.

STURDY TRACK WHEEL WAGONS
Sturdy track wheel wagons which will withstand all weather and ground conditions and offer dependable and continued service are described in literature which the Euclid Crane & Hoist Co., Euclid, Ohio, will be glad to send to those interested.

FOUR AND SIX-CYLINDER ENGINES
Bulletin D describing Climax Blue Streak engines which are made in 4 and 6-cylinder models with a 6-inch bore and 7-inch stroke will be sent to those interested by the Climax Engineering Co., Clinton, Iowa.

ROAD GRADER BLADES
Catalog No. 29, describing the Empire road grader blades which are made of a new alloy steel and have an exact degree of curvature for better grading, may be secured from General Wheelbarrow Co., 3140 East 65th Street, Cleveland, Ohio.

MODERN AND VERSATILE TRACTORS
Allis-Chalmers Mfg. Co., Monarch Tractors Div., Springfield, Ill., will be glad to send to those interested complete information in regard to Monarch tractors which are modern in design, versatile and powerful.

A COMPLETE LINE OF EXCAVATING EQUIPMENT
A 24-page booklet describing the complete line of Speeder cranes, shovels, skimmers, drag lines, pull shovels and trailers for use in all types of digging, dirt moving and similar operations will be sent on request by the Speeder Machinery Corp., Cedar Rapids, Iowa.

BATCHER AND CONCRETE PLANTS
Literature describing the Butler batcher and concrete plants for central mixing or mixing in transit which can operate the whole year through may be secured by those interested from Butler Bin Co., Waukesha, Wis.

FLEXIBLE RUBBER TRAFFIC SIGNALS
Flexible rubber traffic signals which are placed in the center of the road and which used throughout a city or town provide a system of traffic control, are described in literature which the Standard Traffic Markers Co., 1711 East Second St., Wichita, Kans., will be glad to send on request.

PUNCHES, DIES AND RIVET SETS
Catalog No. 9 contains a complete description of Cleveland steel punches, dies and rivet sets as well as chipping chisels and tools and may be secured from the Cleveland Steel Tool Co., 660 East 82nd St., Cleveland, Ohio.

A NEW DITCHER WITH OFFSET VERTICAL BOOM
Barber-Greene Co., Aurora, Ill., will be glad to send to those interested complete information in regard to the new Barber-Greene utility ditcher among the features of which are an offset vertical boom which may be set at the desired position, and an automatic overload safety sprocket which protects the machine against overloads.

THE STEEL BACKBONE FOR CONCRETE
Wire fabric which acts as a steel backbone for concrete and which comes in convenient sized sheets or rolls is described in a Road Book which the American Steel & Wire Co., 208 South LaSalle Street, Chicago, Ill., will be glad to send on request.

A SELF-PRIMING CENTRIFUGAL PUMP
Literature describing LaBour pumps, including the No. 2½ LaBour self-priming centrifugal pump, various sizes of which are available for portable or stationary service, with either belt, motor or gasoline engine drive, may be secured from LaBour Co., Inc., Elkhart, Ind.

A NEW MATERIAL LOADER
The Nelson Q-7 loader, among the features of which are smooth-running spiral feeders that dig without shock to the machinery, 3-bearing foot shaft that does not bend and sprockets that stay tight, manganese chains and sprockets where abrasive stone is to be handled, long-base crawlers and a 2-yard a minute capacity, is described in literature which may be secured from N. P. Nelson Iron Works, Inc., 822 Bloomfield Ave., Passaic, N. J.

EXPANSION JOINTS FOR CONCRETE PAVEMENT
Sealtight joints for protection against expansion in concrete pavement are described in literature which W. R. Meadows, Inc., Elgin, Ill., will be glad to send on request.

TURBINE AIR CONCRETE SURFACERS
Turbine concrete air surfacers for removing fins and board marks, for rubbing out irregularities on concrete walls and buildings and for exposing the aggregate of artificial concrete blocks are described in a catalog which the Tousley Tool Co., 1965 East 66th Street, N. E., Cleveland, Ohio, will send on request.

Making CUTS

In the Road and in the Cost of Hauling

EUCLID

EUCLID Track Wheels WAGONS

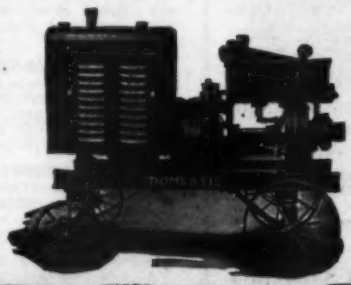
We show two trains of Euclid Wagons on a road job working under an elevating grader. Euclid Wagons are designed to work with ease and economy under a shovel or elevating grader.

Short turning radius, large capacity and ease of draft are three points which enable the contractor to haul more dirt at lower cost.

Let us tell you of jobs where Euclid Wagons have aided many contractors to earn a profit under adverse conditions. Write for details.

EUCLID CRANE & HOIST CO.
Euclid, Ohio

"DOMESTIC" AUTOMATIC PRIMING CENTRIFUGAL PUMPS



This Pump absolutely primes itself; and will draw water 27 feet vertical.

Is ideal for use on all types of dewatering jobs including Drainage Point Predrainage, etc.

The positive high vacuum this Pump is able to create has, in many cases enabled contractors to drain DRY, deep excavations where other suction type pumps have failed.

Automatic Control of vacuum producing action keeps the Pump primed whenever there is enough water to seal and fill the suction line. This is a valuable feature, as it not only gives large pumping possibilities but KEEPS the excavation DRY by taking care of seepage inflow.

In addition to these Automatic-Priming Centrifugal Pumps—the "DOMESTIC" Pump line includes the "Giant" self-oiling Triplex Road Pump, Diaphragm Pumps, Vertical Plunger Trench Pumps, Triplex and Sextuple Jetting Pumps, etc.

Literature upon request

Manufactured by

DOMESTIC ENGINE & PUMP CO., Shippensburg, Penna.

CEM11-29

LOOMIS "CLIPPER"

for Blast Hole Drilling

The Loomis "CLIPPER" drill is unequalled for drilling blast holes, building and foundation tests, mine air shafts, coal prospecting and stripping, mineral tests, oil and water wells.

This self-propelling Loomis "CLIPPER" drill is specially designed for your work. Fitted with crawler or round wheels and powerful gasoline or electric motor. All levers are within easy reach of the operator. Steel frame furnished if wanted.

Write for our illustrated bulletin

THE LOOMIS MACHINE COMPANY

10th Street Tiffin, Ohio

"The Strongest Geared Power for Its Weight in the World"

CAPACITY 5 TONS STRAIGHT LINE

POSITIVE INTERNAL BRAKE

Weight 110-lbs.

Size 16x17x13-in. high

Two Speeds 4 to 1 24 to 1

Price $80 F. O. B., Warehouse Points Chicago, Brooklyn, New Orleans, Houston

Write for descriptive circular with users's endorsements and name of nearest dealer.

Dealers in Principal Cities

BEEBE BROS.

3219 First Ave., So. Seattle, Wash.

LOWER Your Costs—WIN More Jobs

"American" portable woodworking machinery is helping hundreds of contractors to cut labor costs and lower their bids. Ask for details on this Band Saw and our Saw Rigs and Hoists.

Agents wanted for open territory

AMERICAN

SAW MILL MACHINERY COMPANY

Makers of

Woodworking and Saw Mill Machinery

Fig. 1086 171 Main St. Hackettstown, N. J.

Simplex Jacks

for Industries-Utilities-Railways-
Oil Wells-Mines-Engineering Contractors-
Simplex Lever Jacks-Pipe Pushers-Trench Braces-
Simplex Screw Jacks-with the Visible Screw-

Distinctive in Man Power, Safety & Simplicity

Templeton, Kenly & Co., Chicago, U.S.A.

The World's Largest Manufacturers of Jacks

Baldwin Locomotive Works, Foreign Representative

Simplex Screw Jack with the Visible Screw

Contractors—Use This Service

SHEET PILE DRIVERS

Bulletin No. 87-B describing the Sullivan Q-1 and Q-2 sheet pile drivers, which are adapted from the busters by the substitution of suitable front end parts, may be secured by those interested from Sullivan Machinery Co., 400 North Michigan Ave., Chicago, Ill.

ENGINES OF FROM 3 TO 180 HORSEPOWER

LeRoi Co., Milwaukee, Wis., will be glad to send to those interested complete information in regard to LeRoi engines which range in size from 3 to 180 horsepower.

ELECTRIC GRINDERS FOR CONTRACTORS' USE

The Van Dorn Electric Tool Co., Cleveland, Ohio, will be glad to send to those interested complete information in regard to the new 7-inch Flex-Disc grinder for use in smoothing welded and soldered joints and seams, smoothing metal surfaces and similar purposes and also the new 7-inch bench grinder for sharpening all sorts of tools and for light grinding.

NEW HEAVY DUTY ENGINES

Literature describing the new Hercules aeris OO 4-cylinder engines in lower horsepower ranges which are built in three models and are small counterparts of the Hercules OX series may be secured by those interested from Hercules Motors Corp., Canton, Ohio.

TWO NEW CONCRETE MIXERS

Two new Giant mixers, 56-S and 84-S, which are especially designed for use in large construction jobs in the industrial field and in central mixing plants, are described in Bulletin No. 122 which Ransome Concrete Machinery Co., Dunellen, N. J., will be glad to send on request.

THE WORK OF A TUNNELING MACHINE

A tunneling machine 7½ feet in height, 20 feet long and weighing about 18 tons which chips away the rock by the action of a number of pneumatic hammers with chisels mounted on the head is described in literature which may be secured from the App Tunneling Machine Co., Inc., 1 Madison Ave., New York.

EIGHT NEW CHASSIS TYPES FOR HEAVY-DUTY TRUCK

Eight new special chassis types, known as T-60 specials and with capacities ranging up to 22,000 pounds, which are designed for use with GMC Model T-60 trucks are described in literature which may be secured from General Motors Truck Co., Pontiac, Mich.

CONCRETE SLABS FOR ROOF CONSTRUCTION

Complete information in regard to concrete slabs for roof decks which are made of a special composition Haydite concrete insuring lighter weight and insulation, may be secured from the Federal Cement Tile Co., 608 South Dearborn St., Chicago, Ill.

A NEW LINE OF COMPRESSORS

Worthington Pump & Machinery Corp., Harrison, N. J., will be glad to send to those interested complete information in regard to its new line of Worthington compressors, among the features of which are Timken roller bearings on the main crankshaft journals, a completely enclosed oil-tight crankcase, Feather valves and an automatic starter.

NEW PORTABLE WELDER DRIVEN BY GAS ENGINE

A complete description of the new portable arc welding machine driven by a 6-cylinder Buda gasoline engine which is mounted on a welded structural steel base and may be made portable by the addition of running gear, may be secured from General Electric Co., Schenectady, N. Y.

A ¾-YARD SHOVEL, CRANE, CLAMSHELL AND DRAGLINE

A bulletin describing the Lorain-45, a new ¾-yard shovel, crane, clamshell and dragline which is designed to supplement the present Thew line may be secured by those interested from Thew Shovel Co., Lorain, Ohio.

A NEW TYPE OF DRIVE FOR 6-WHEEL TRUCK

A new 6-wheel truck that is a distinct departure from the unusual method of applying the power to the rear axles and on which the driving force is applied to the front and first rear axles through a center differential located in the transmission is described in literature which may be secured from the Four Wheel Drive Auto Co., Clintonville, Wis.

PORTABLE ROCK CRUSHING PLANTS

Champion roller bearing reduction rock crushers on portable mountings with folding type bucket elevators complete, as well as storage bins with screens mounted thereon to make the second portable unit of the plant are described in literature which may be secured from Good Roads Machinery Co., Kennett Square, Pa.

HIGH SPEED AND HEAVY DUTY TRAILERS

Electric Wheel Co., Quincy, Ill., will be glad to send to those interested literature describing the EWC high speed trailers in a variety of models for speedy transportation work as well as the EWC trailers for use with heavy-duty tractors to meet the various requirements of contractors and road builders.

A COMPLETE LINE OF BUCKETS

Hayward clamshell, orange peel, dragline and electric motor buckets, dredging, excavating and material handling equipment, automatic take-up reels and counter weight drums are described in literature which the Hayward Co., 32-36 Dey St., New York, will be glad to send on request.

A COMPLETE LINE OF ASPHALT PAVING PRODUCTS

Complete information in regard to Standard asphalt binder for surface treatment, penetration or mixing method, asphalt joint fillers for brick or block pavements, cold patch asphalt for repair work, asphalt for sheet asphalt paving, paving flux, and bridge asphalt and reserving oils may be secured from Standard Oil Co. of New York, 26 Broadway, New York.

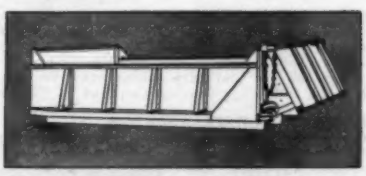
Wood-equipped Relays filling out a new road

WHEREVER ROADS ARE BUILT

dependable Wood hoists and bodies give continuous, unfailing service

ROADBUILDING lays down the stiffest punishment a dump truck ever gets anywhere. Yet roadbuilding demands continuous, unfailing year in and year out performance of the hoist and dump body.

Every Wood hoist and body is engineered and built especially for the work it must do. The complete line includes Underbody Hydraulic Hoists—Vertical Hydraulic Hoists—Mechanical Hoists—Hand-Operated Hoists—Gravity Dumpers—Repair Tower Hoists—Hi-Lift Units—Power Take-Offs and Steel Dump Bodies for every hauling need. Catalogue 10 will gladly be sent upon request.



Wood type W-12 Steel Body is famous for its strength. Fully braced and gusseted for heavy duty service. Comes in standard sizes to fit any chassis. Capacities up to 15 cu. yds.

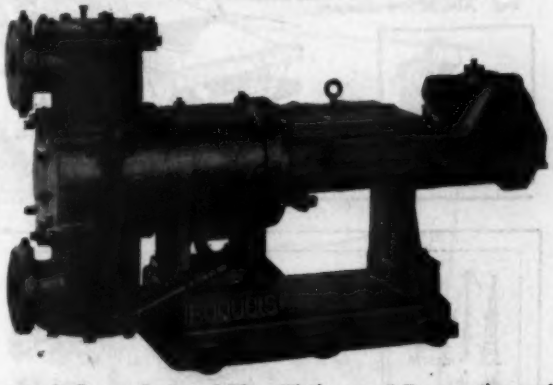
WOOD HYDRAULIC HOIST & BODY CO.
DETROIT, MICHIGAN

WOOD
HOISTS & BODIES

BRANCHES AND DISTRIBUTORS IN PRINCIPAL CITIES

IROQUOIS
Steam-Jacketed PIPE, FITTINGS *and* PUMPS

for pumping asphalt and other viscous materials that will not flow at atmospheric temperatures.



Iroquois Steam-Jacketed Pipe, Fittings and Pumps give such complete satisfaction in asphalt, oil and coal-tar refineries, and plants manufacturing prepared roofing, gas, chemicals, starch, glucose, molasses, fatty acids, etc., because they are specially designed for those particular purposes.

Some of the distinctive features are:

- **Minimum number of working parts in contact with material being pumped.**
- **Large wearing surfaces to reduce wear.**
- **Large, straight passages for liquid being pumped.**
- **Simplicity of construction insures low maintenance cost.**
- **Ease of operation with no skilled attention.**
- **Steam jackets cover all moving parts—pump can be started and stopped at will without cleaning out.**
- **Perfect accessibility of all wearing parts.**
- **No springs or small, easily broken parts in valve chambers.**
- **Handles successfully viscous material containing large quantities of foreign matter without undue wear or operating troubles.**

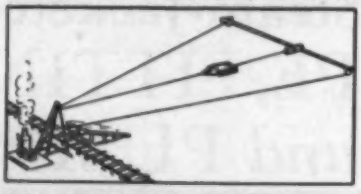
Write us today for full data and specifications. We will also send you information regarding the complete Iroquois Line of road-building machinery.

Iroquois Sales Department

THE BARBER ASPHALT COMPANY
PHILADELPHIA

NEW YORK	CHICAGO	PITTSBURGH
ST. LOUIS	KANSAS CITY	SAN FRANCISCO

THE CONTRACTOR'S FRIEND
Moves dirt when you want it and places it where you want it. Also, cleans lakes and builds dams.



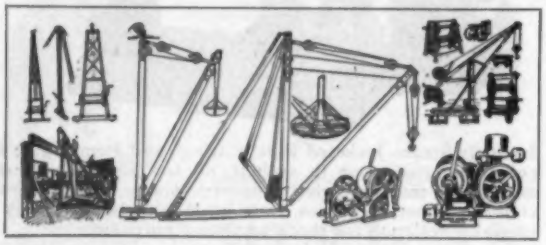
SCHOFIELD-BURKETT CONSTRUCTION CO.
Macon, Georgia
Manufacturers of Cable Drag Line Equipment
Eastern Office: 150-02 Sixth Avenue, WHITESTONE, N. Y.

Save $200
over ordinary mixers on Jaeger's One Bag
SPEED KING
with Accurate Measure Water Tank, Skip Shaker and 100% Roller Bearing. Also in low chargers.

TRAIL IT—ONE MAN LIFTS IT!

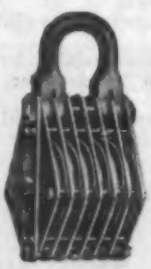
DUAL TIRES SPRINGS

Write for catalog, prices, terms.
THE JAEGER MACHINE CO.
701 Dublin Ave. Columbus, Ohio



We have a complete line of Derricks and Winches
SASGEN DERRICK CO.
3101 Grand Ave. Chicago, Ill.

* STAR BRAND *
HOISTING BLOCKS
Are Always Reliable
Made for
Every Condition of Service
Sold by
Leading Supply Houses



Let us help you with your problems
BOSTON & LOCKPORT BLOCK CO.
NEW YORK BOSTON CHICAGO

Contractors—Use This Service

A SELF-PRIMING PORTABLE CENTRIFUGAL PUMP
Complete information in regard to the self-priming Homelite portable centrifugal pump which pumps from 1 to 6,000 gallons per hour, has an air-cooled engine and weighs but 75 pounds, may be secured by those interested from Homelite Corp., 71 Riverdale Avenue, Port Chester, N. Y.

RAIL FORMS FOR CONCRETE FORMS
The Lakewood Engineering Co. (Lion Gardiner, Vice-Pres.), Cleveland, Ohio, will be glad to send to those interested complete information in regard to the new Lakewood Duo-Rail forms which are designed to get smoother riding surface on concrete roads and which are so made that the load of the finishing machine is carried over the center of the base of the form by an auxiliary rail, thus adding to the stability and bearing value of the form.

AN 8,500-GALLON ONE-MAN PORTABLE PUMP
Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, will send to those interested literature describing the Jaeger one-man portable pump which can handle 8,500 gallons at a 20-foot head with 25 to 28 per cent solids and weighs only 200 pounds.

A NEW HEATING ATTACHMENT FOR CONCRETE MIXERS
Littleford Brothers, 500 East Pearl St., Cincinnati, Ohio, will be glad to send to those interested complete information in regard to the new universal heating attachment for tilting drum concrete mixers with capacities of 5 cubic feet or more.

AUTOMATIC PRIMING PUMPS
Domestic automatic priming centrifugal pumps which primes itself, draws water 27 feet vertical and may be used on all kinds of dewatering jobs is described in literature which may be secured from Domestic Engine & Pump Co., Shippensburg, Pa.

A PNEUMATIC ROTARY GRINDER
The Chicago Pneumatic Tool Co., 6 East 44th St., New York, will be glad to send to those interested complete information in regard to the new CP pneumatic rotary grinder, which is made in two styles, with a straight or pistol grip handle for smoothing concrete surfaces, soldered or welded metal and similar work.

HEAVY DUTY TRUCKS
Complete information in regard to International trucks, which are made in a number of sizes and models for heavy-duty service and which have 5 forward and 2 reverse speeds may be secured by those interested from International Harvester Company of America, Inc., 606 South Michigan Ave., Chicago, Ill.

TWO-WHEEL BALANCED CARTS
Literature describing the Red Star two-wheel balanced carts which are light in weight and yet ruggedly constructed, easy to load, wheel and unload and have a welded water-tight hopper may be secured from the Cleveland Wheelbarrow & Manufacturing Co., P. O. Station D, Cleveland, Ohio.

CONCRETE TIES
Literature describing the Bulldog concrete form ties suitable for all types of concrete forms may be secured by those interested from J. M. Willard Co., Inc., 1083 West 30th St., Los Angeles, Calif.

CORRUGATED PIPE FOR SEWERS AND DRAINAGE
A bulletin describing Armco corrugated pipe for use in storm sewers, drainage systems and similar purposes may be secured from Armco Culvert Manufacturers Assn., Middletown, Ohio.

MARKED WIRE ROPE
Wire rope, the kind and grade of which is marked by Telfax Tape in the hemp core of the rope, thus assuring safety in its use, is described in literature which the Williams Wire Rope Co., People's Gas Building, Chicago, Ill., will send on request.

PORTABLE BELT CONVEYORS
Portable belt conveyors for moving or piling material, which are made in lengths of 15 to 100 feet with belts 14, 16, 18 or 24 inches, and which are equipped with either a gasoline engine or an electric motor, are described in literature which may be secured by those interested from the Atlas Engineering Co., Box N, Clintonville, Wis.

A NEW LINE OF CLAMSHELL BUCKETS
Bulletin C, describing the 21 features of the new line of Williams Champion "super" clamshell buckets will be sent on request by G. H. Williams Co., 609 Haybarger Lane, Erie, Pa.

STEAM-JACKETED PIPE AND PUMP FOR ASPHALT
The Barber Asphalt Co., Iroquois Sales Dept., Philadelphia, Pa., will be glad to send on request complete information in regard to the Iroquois steam-jacketed pipe fitting and pump for pumping asphalt and similar viscuous materials which will not flow at atmospheric temperatures.

STEEL SHEET PILING
Complete information in regard to steel sheet piling which may be bought, sold or rented may be secured by those interested from Wemlinger, Inc., 149 Broadway, New York.

A CONVERTIBLE TRACTOR SHOVEL
Bay City Shovels, Inc., Bay City, Mich., will be glad to send to those interested complete information in regard to the Bay City convertible tractor shovel which is a mobile, sturdy and rugged unit and can be equipped with special attachments converting it into a crane, dragline, trench-scoop or back filler.

COPPER STEEL STORAGE BINS
Catalog 100, describing the Beaumont copper steel storage bins which are built of copper bearing steel plates of rigid and bolted construction, easily portable with full gravity discharge and built in standard sizes, may be secured from Beaumont Manufacturing Co., 330 Arch Street, Philadelphia, Pa.

THE RIGHT TOOL SAVES TIME

. . For Grading

Here is the finest time and labor saving tool ever designed for light ditching, leveling up the roadbed or other excavations, trimming and grading shoulders. One man with this tool does nearly as much as two men with pick and shovel.

Workmen like the True Temper Grading Hoe because it is perfectly hung, swings easier than a pick, and does more work with less effort.

Blade and eye forged from one piece of high carbon steel, oil tempered. Three and one-half foot selected hickory handle, oval shaped to fit the hand. Blade is 7 inches wide and 7¼ inches deep.

The brand True Temper is burned in the handle to mark each hoe as the best tool of its kind that can be made.

THE AMERICAN FORK & HOE COMPANY
1937 Keith Building
Cleveland, Ohio

Makers of Farm and Garden Tools for over 100 years.

Branded on the handle of every genuine TRUE TEMPER *tool*

If your dealer has not yet stocked the Grading Hoe, Cat. No. IGH7, send us his name and $2.10 and we will supply you direct; postpaid.

FREE *on request*
Heavy Steel Goods or Industrial Tool Catalog. Describes over 50 tools for mill, mine, factory and coal yard.

TRUE TEMPER TOOLS

FLORY

"FLOR-OX" 35 and 50 LEAD IN THE GENERAL CONSTRUCTION FIELD

FLORY'S New Hoists—the "FLOR-OX" 35 and 50—have many new features that make them leaders in the hoisting field. The "FLOR-OX" is marked by smoothness of operation, the utmost dependability and extreme ruggedness of construction. It can be powered by either a gasoline or electric motor and it can be altered in the field from a single to double or triple drums by bolting units together. Before you buy a hoist send for the bulletin on this new hoist. It has no equal in the general construction field.

FEATURES OF THE
"FLOR-OX" 35 and 50

ROLLER BEARING THRUSTS FOR FRICTION CLUTCHES

LESS WEIGHT AND SPACE WITH GREATER EFFICIENCY

POSITIVE RELEASE DEVICE ON FRICTION LEVERS

ALEMITE LUBRICATION

THE "35" HAS A ROPE PULL OF 5000 POUNDS AT 165 FEET PER MINUTE

THE "50" HAS A ROPE PULL OF 7000 POUNDS AT 165 FEET PER MINUTE

EXTRA HEAVY SHAFTS AND BEARINGS

SILENT CHAIN DRIVE ENCLOSED IN DUST PROOF CASING

MACHINE CUT TEETH ON ALL MAIN GEARS AND PINIONS

S. FLORY MFG. CO.
BANGOR, PA.

HOISTS, CABLEWAYS, CAR PULLERS, ETC.

LAKEWOOD PAVING EQUIPMENT

NOVEMBER

WHEN you're a long way from nowhere with a time clause in the contract—then you're glad you have a Lakewood Type "C" Finisher with modern, automotive type of construction that gives real speed of operation and the assurance of smooth, uninterrupted performance. Direct shaft-drive to all wheels.

The photo above shows a Lakewood Type "C" owned by the Grace Construction Co. operating in Indiana. Bulletin 47-M shows practically all types of paving and the latest methods of finishing machine operation. We have a copy for you.

EXPORT OFFICES: 50 Church St., New York City · · CABLE ADDRESS: Brasiwa

LAKEWOOD

The Lakewood Engineering Co., CLEVELAND · O.

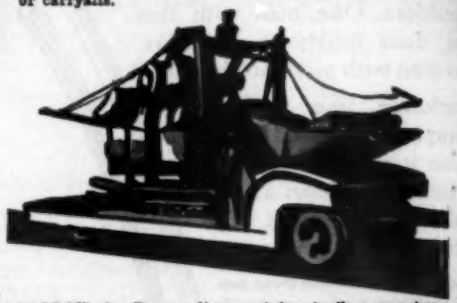
ROGERS

World's Standard HEAVY DUTY

TRAILERS

IT has been the privilege of this company to prove the statement of a great philosopher who wrote: 'The devotion of thought to an honest achievement makes that achievement possible.''

For many years, all thought and endeavor of this organization has been devoted exclusively to the development and refinement of heavy duty trailers, or carryalls.



TODAY the Rogers line contains trailers ranging from 5 to 100 tons capacity, all of uniform proven design. There is a type for every purpose. Satisfied users are to be found in every state of the Union and in many foreign countries. The name ''Rogers'' has come to be synonymous with heavy duty trailers.

As a result of these achievements, it can be truly said that the Rogers is today generally conceded to be ''The World's Standard Heavy Duty Trailer.''

ROGERS BROS. CORPORATION

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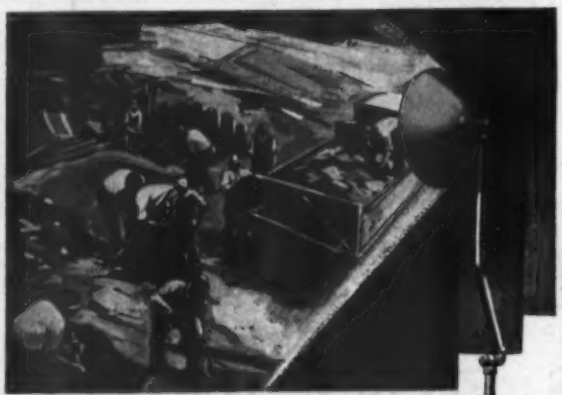

From Start To Finish With Carbic Light

Wherever building and construction work is carried on, emergencies are bound to arise. Breakdowns, adverse weather conditions and unexpected holdups tend to make the job lag behind. Such delays, however, may often be economically overcome by a regular night shift.

Successful contractors throughout the country provide Carbic Flood Lights for their jobs from start to finish and keep up to schedule. Contracts completed on time give them added profits — and reputations.

Carbic Flood Lights are simple, rugged and portable. They are always ready for service. Carbic Light costs only a few cents an hour and under its clear white rays your men can work with daylight rapidity and safety.

Complete the Job on Time with Carbic Light

OXWELD ACETYLENE COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK CITY, Carbide and Carbon Building — CHICAGO, Carbide and Carbon Building

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Technical Publicity Department, Oxweld Acetylene Company, 30 East 42nd Street, New York, N. Y.

Without obligation, I would like to have additional information on Carbic Lights.

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Carbic is distributed by the Union Carbide Sales Company through its several chain of warehouses and is sold by jobbers everywhere.

CARBIC

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DOWFLAKE

CALCIUM CHLORIDE

DOW

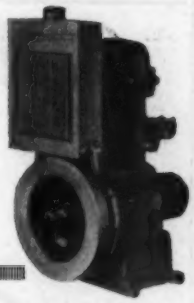
Use DOWFLAKE *for* Surface or Admixture Curing

Regardless of whether you favor the surface or admixture method of curing, you will find that Dowflake Calcium Chloride will prove one of the most helpful aids you have ever had on a concrete paving job. For Dowflake makes curing a matter of easily supervised routine. ¶ Dowflake is shipped in 100-lb. moisture-proof bags and 400-lb. air-tight steel drums. Write for our interesting book "How To Cure Concrete."

THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN

Be sure to visit the Dowflake Display at the Road Show, Atlantic City, January 11th to 17th inclusive



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Vertical Motors

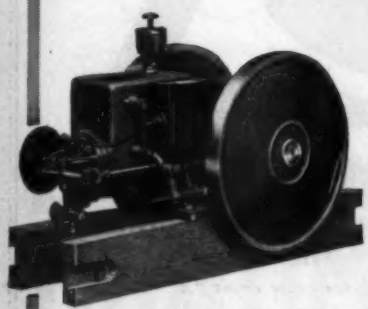
Substantial, Light Weight Automotive Type

Built Both Air and Water Cooled

Specially suited for application to all sorts of portable and stationary units—compact, self-contained, moderate weight with all working parts substantial enough to endure continuous service.

The air cooled develops 1½ HP. at 1200 R.P.M. and may be run up to 2000 R.P.M. The Water Cooled develops 1½ to 2½ HP. according to speed run.

Kerosene and Gasoline Engines 1½ to 35 hp.



33 years of popularity with Contractors and Industrial users. LAUSON Engines are world-famous for first-class quality and trouble-free operation. They are built up to the finest automotive standards, Hutto ground cylinders and many other production practices unusual in Engines of this type. Built in a wide variety of styles. Get our Engine catalog.

Send for Special Bulletin

We also build Concrete Mixers: Single- and Double-Diaphragm Pumpers; Heavy-Duty Power Units 35-60 HP.; Contractors Saw Rigs; Plaster and Mortar Mixers and Contractors Road Tractors.

The JOHN LAUSON MFG. CO., 11 Jackson St., New Holstein, Wis.

CHECK *THESE* JOHNSTON BOILER FEATURES!

Before you buy your boiler consider these Johnston features!

1. Sixty-five years boiler building experience
2. Over 5,000 boilers in use the world over
3. 500 tons of metal always carried in stock, assuring prompt delivery
4. Modern production—speeding equipment and skilled workmen
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Insure maximum quality and efficiency by demanding the Johnston trade-mark on your boiler

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Specializing in Boilers for Contractors' Equipment

Digging Bridge Footings with SULLIVAN Spaders

More than half the material removed for footings on the new bridge over the Maumee, at Napoleon, Ohio—is blue clay, hard pan, and limestone.

But SULLIVAN Spaders run by a SULLIVAN Vibrationless Compressor, take it out quickly. Footings 18 x 82 x 15 were completed in four 12-hour days, using 12 men with Spaders, and two with Rotators.

Extra profits on bridge, or building excavations, and on many water and sewer jobs, await the contractor who adopt SULLIVAN Spaders.

Send for the picture book, 87-A

SULLIVAN MACHINERY COMPANY

814 WRIGLEY BUILDING, CHICAGO

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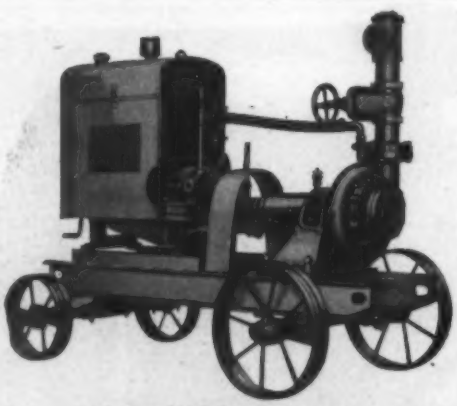
DRAWING INKS

black and white and 18 brilliant shades

Send for color chart "A"

Pelican Works—Gunther Wagner, Inc.

34 East 23rd Street New York, N. Y.



C.H.&E.

SEWAGE AND TRASH PUMPS

Impeller will pass anything entering the suction nozzle: sewage, roots, weeds, stones, sod, wood-trash.

No foot valve needed.

Simple, quick, effective priming with C. H. & E. Priming Device.

Capacity per minute: from 800 gallons No. 4 Pump to 2,500 gallons No. 8 Pump.

Write for Bulletin

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C. H. & E. MANUFACTURING CO., INC.

250 Mineral Street Milwaukee, Wis.

DIXON'S WATERPROOF GRAPHITE GREASE

The graphite is the vital element, for it imparts to bearing surfaces a remarkable smoothness that relieves the grease of a very considerable portion of its task of keeping metallic bearing surfaces apart and takes upon itself the wear which would be borne by the metal. The flake graphite increases both the efficiency and durability of the lubricant.

On account of its great adhesiveness and tenacity, Dixon's Waterproof Grease will not be thrown from gears, etc., under ordinary conditions. It is not wasted by dripping and cannot be washed off by water. It not only lubricates but is a sure rust preventive as well.

These properties highly commend its use upon; wire ropes, chains, exposed gears, cranes, derricks, dredges, steam shovels, pump plungers, hoisting engines, or any other machinery requiring a heavy-duty or waterproof lubricant.

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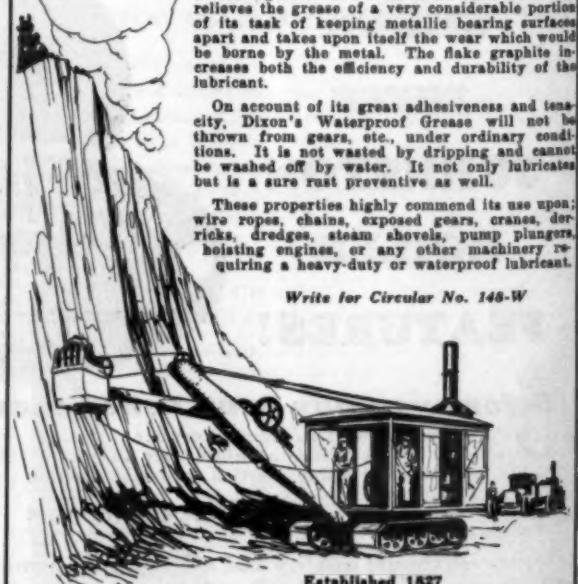

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JOSEPH DIXON CRUCIBLE CO.

Jersey City New Jersey

THE ONLY BINS BUILT ENTIRELY OF COPPER BEARING STEEL

To produce a bin of the best possible engineering design and enduring qualities, Beaumont Bins are built entirely of copper bearing steel plate. They are the only bins on the market with this feature.

9 big features

1. Constructed of copper bearing steel plates which insures the bin lasting two to three times as long as ordinary steel bins.
2. Structurally rigid, properly designed and all bolted construction.
3. Built in standard sizes to answer all possible requirements.
4. Easily portable.
5. Full gravity discharge, no clogging in the bins and at gates.
6. Speeds up material handling.
7. No projecting columns to prevent bins being placed side by side.
8. Ample truck clearance is provided.
9. Easy erection. Shipped in a few parts that are all match-marked and accurate as to hole spacing.

Write for Catalog 100

BEAUMONT MANUFACTURING CO.

330 Arch Street, PHILADELPHIA
2103-E Straus Bldg., CHICAGO

BEAUMONT COPPERSTEEL BINS

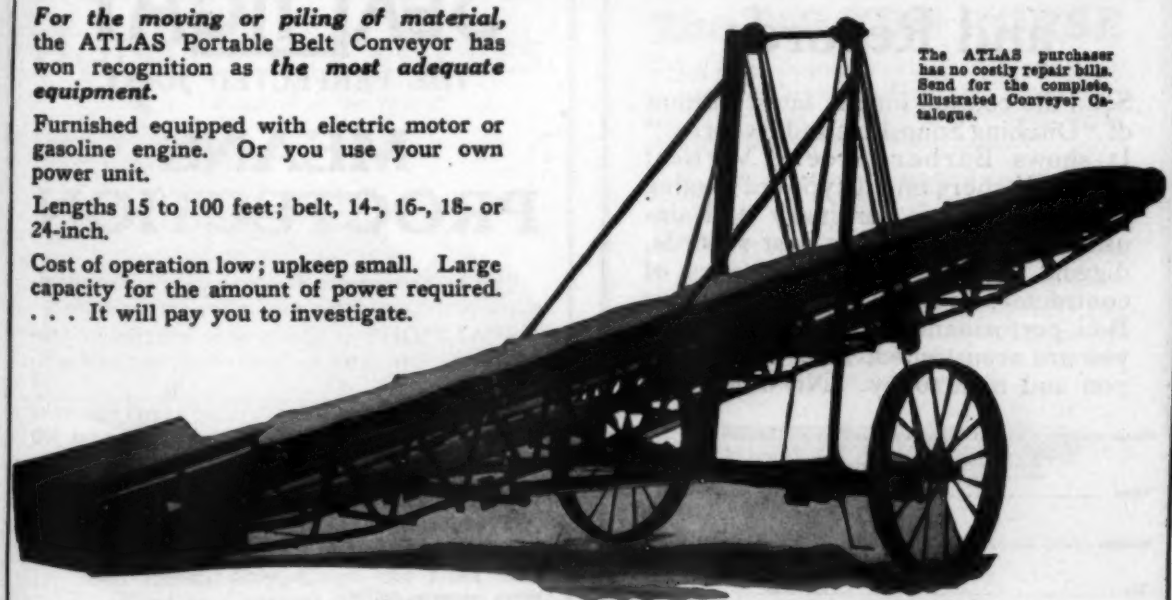
ATLAS Portable Belt CONVEYORS

For the moving or piling of material, the ATLAS Portable Belt Conveyor has won recognition as ***the most adequate equipment.***

Furnished equipped with electric motor or gasoline engine. Or you use your own power unit.

Lengths 15 to 100 feet; belt, 14-, 16-, 18- or 24-inch.

Cost of operation low; upkeep small. Large capacity for the amount of power required. . . . It will pay you to investigate.



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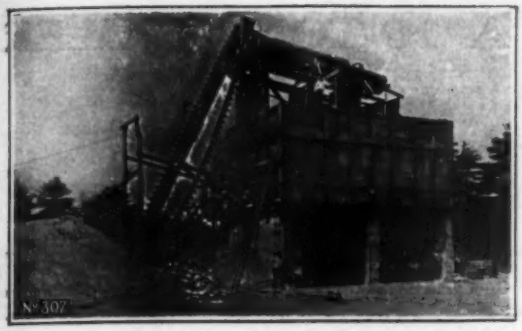

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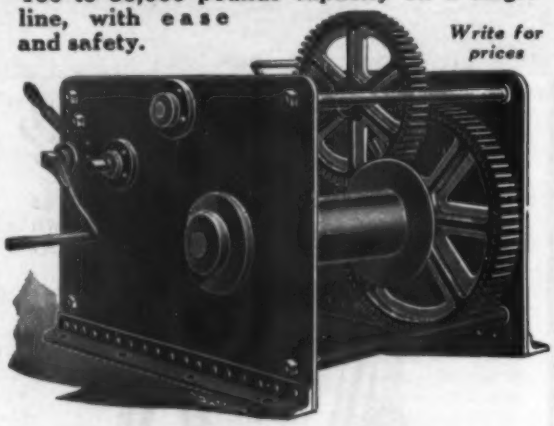

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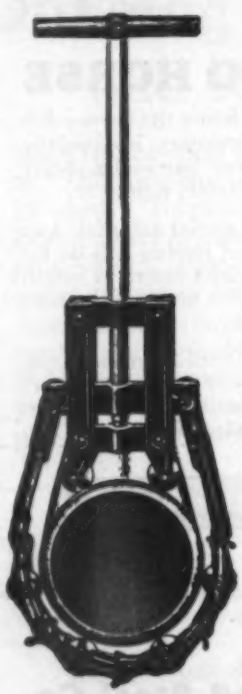

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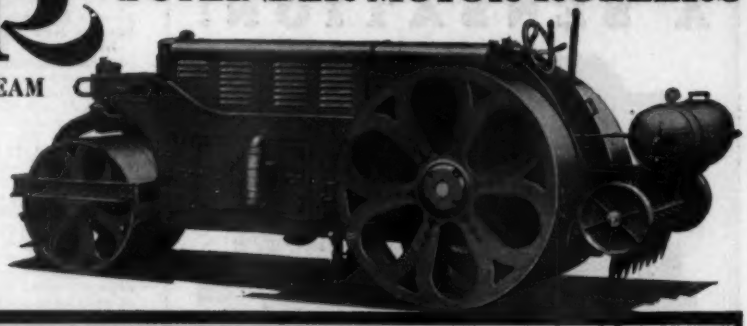

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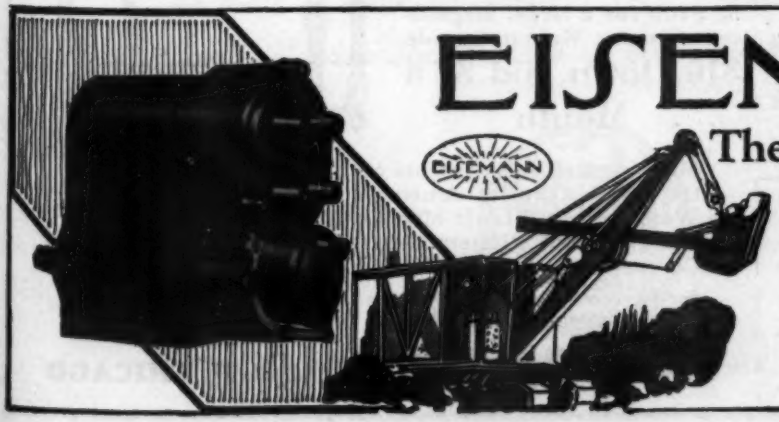

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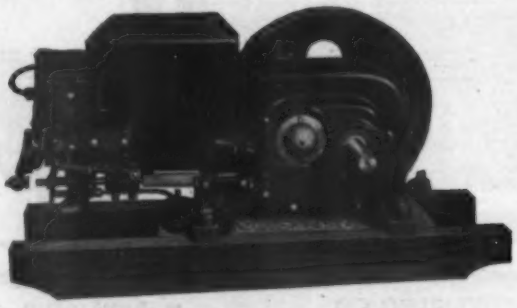

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State of New York, County of New York, ss.:

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared EDGAR J. BUTTENHEIM, who, having been duly sworn according to law, deposes and says that he is the President of the Buttenheim-Dix Pub. Corp., Publishers of CONTRACTORS AND ENGINEERS MONTHLY and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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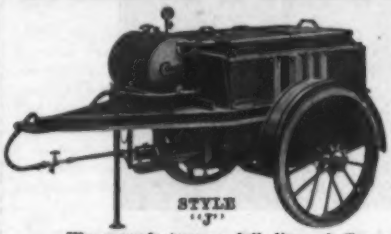
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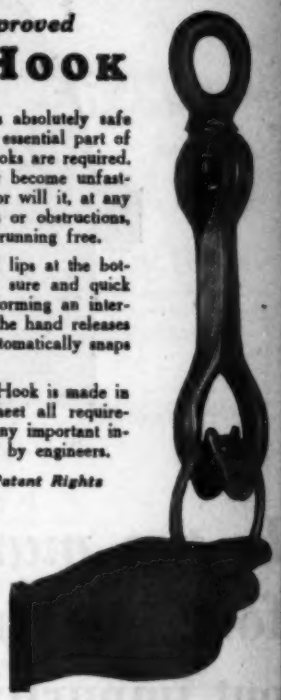

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